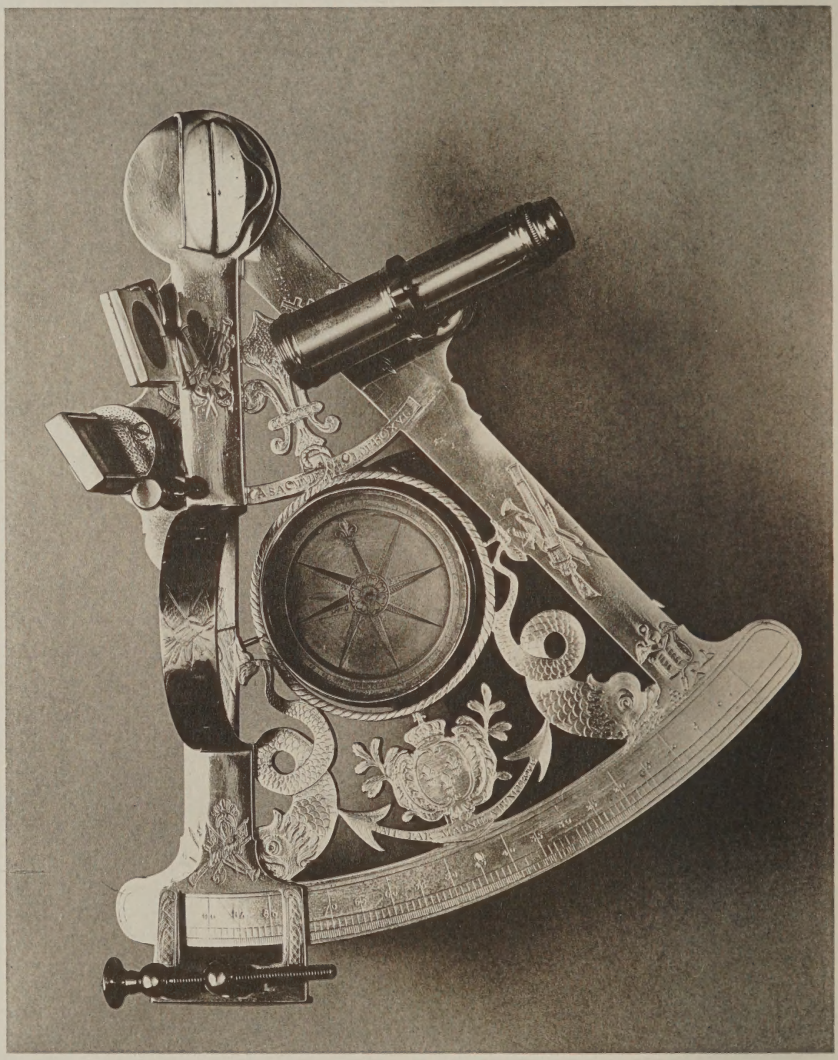
NAVIGATING INSTRUMENTS



Louis XVI Octant by Magnie, c.1786

The Peabody Museum Collection of

NAVIGATING INSTRUMENTS

WITH NOTES ON THEIR MAKERS

By

M. V. BREWINGTON

Curator of Maritime History

1963 PEABODY MUSEUM
SALEM, MASSACHUSETTS

Printed by The Anthoensen Press, Portland, Maine
Collotypes by Meriden Gravure Company, Meriden, Connecticut

Preface

SINCE *its organization in* 1799 *as the East India Marine Society, the Peabody Museum has acquired, largely by gift, a great collection of navigating instruments. With the original membership of the Society composed of men who as masters had navigated "in the Seas near or beyond the Cape of Good Hope or round Cape Horn," one would naturally expect an intense interest in the science of navigation, especially when one of the leaders of the Society was none other than Nathaniel Bowditch. He, the author of* The New American Practical Navigator, *formed a sizeable collection of instruments ranging from a sixteenth-century astrolabe to the most modern sextant obtainable in his day. In addition, at the age of nineteen he designed and made an instrument which was as near a self-contained universal navigating device as one could expect to find at that time. All of Bowditch's known instruments, except one, are in the collection of the Peabody Museum, together with examples of virtually every other type of instrument used in practical navigation.*

Among them are found such rarities as the oldest signed and dated instrument by an American maker; a Lovelace log-timer; two original cross staves; and a variety of oddities designed to aid the navigator in "discovering the longitude." Each signed and dated instrument is described. However, in a few minor categories such as parallel rules, scales, dividers and straight edges, ordinary unmarked pieces varying only in size or materials are omitted. This Collection is here described for the first time, and whenever it has been possible, biographical notes on the makers of the instruments have been added. The

Museum's great collection of charts, sea-atlases and globes is not included. They need a catalog of their own.

I wish to thank the following persons for their assistance in compiling the catalog or in finding material on the makers.

David P. Wheatland, Dr. Derek DeS. Price, C. E. Smart, Dr. Harold Bowditch, M. Henri Michel, Commander W. E. May, R.N., William Bushby, Colonel E. P. Hamilton, Francis B. Remon, Captain Andrew Davidhazy, Commander David W. Waters, R.N., Miss Susanna Fisher, and E. W. Paget-Tomlinson.

The large number of illustrations has been made possible by gifts to the Museum for the photography by Mrs. Dorothy E. R. Brewington and for their publication by Mr. David P. Wheatland. We are also grateful to Mr. Paul Fenimore Cooper, Jr., for material assistance in printing this book.

M. V. Brewington
Curator of Maritime History

The Peabody Museum
Salem, Massachusetts

Contents

Illustrations

The illustrations have been chosen to include all the most important pieces and to give all possible details visible to the camera's eye without distortion. Some sense of scale is provided by the catalog numbers which are exactly one half inch high. Photographs of any instrument or its details may be purchased for study purposes from the Museum. In ordering the full catalog number should be given.

Foreword

IN April 1921 John Robinson, then a Trustee and Curator of the Peabody Museum of Salem, published an article in *Old-Time New England* on "Old-Time Nautical Instruments" in which he figured ten instruments from the Museum collections. The same year the Museum published a book by Mr. Robinson entitled *The Marine Room of the Peabody Museum of Salem*. This was, in effect, a catalogue of our maritime collections at that time. The section on Nautical Instruments takes up eleven pages and includes a number of things such as globes, gauging instruments, watches, etc., not included in the present catalog.

The growth of the collection since 1921 is little short of phenomenal. Of the present categories of instruments included herein, Robinson listed one hundred and one. This volume catalogs four hundred and fourteen. In short, the collection has increased fourfold in the past two score and two years. There is a very good reason why the navigating instruments were not numerously represented in our collections in the nineteenth century—the captains were using them. In the 1920's instruments were acquired in large numbers; the last of the Salem mariners were dying off and L. W. Jenkins, then acting Director of the Museum, was a friend of most of the maritime families and a man of vigilance.

Today the collection is one of the greatest, if not the most extensive insofar as working instruments are concerned, in the world. The discriminating reader will not only find such historical treasures as all but one of Nathaniel Bowditch's instruments and the sextant of David Livingstone, but a great many rarities as well. Nevertheless there are still a few items needed to complete this well-rounded collection; for instance, a true mariner's astrolabe, a simple ring dial, and other examples of loadstones.

No navigating instruments are really very old, even when measured

against the written history of mankind. Aids to the master for finding the way of a ship on the high seas are largely a development of the last five hundred years. To be sure the origin of the compass is lost in antiquities' mists. But the astrolabe, most ancient of position instruments, was adapted for sea use by the great geographer, Martin Behaim in 1480. The cross-staff was improved by the explorer John Davis into the Davis quadrant and published by him in 1595. The Hadley quadrant or octant did not come along until 1732 and the sextant was devised about 1757. These were all instruments, each an improvement and refinement on its predecessor, for finding latitude. Longitude continued to be figured by dead reckoning until the chronometer was developed and Captain James Cook gave several of them intensive trial on his second voyage of discovery in 1772-75. Thus, all but the compass dates from within the lifetime of Christopher Columbus and most since his discovery of America.

At about the same time that this collection reached its most extensive development we were fortunate in having M. V. Brewington become Curator of our maritime collections. He has been devoted to the study of maritime history for many years, and especially everything relating directly to sailing ships, their construction and navigation. It is doubtful if there is anyone in the country today better qualified to compile this catalog. We thus have the happy coincidence of a great collection and a distinguished scholar together at the right time. This particular time may also mark the end of an era. Nautical instruments may well have nearly reached the ultimate in their sophistication. The next devices, for navigating the universe, are already being developed. But that, as Kipling often said, will be another story.

Ernest S. Dodge
Director

Peabody Museum of Salem

NAVIGATING INSTRUMENTS

Definitions and Measurements

While the majority of measurements are obvious, certain categories require some explanation. All the dimensions are taken to the nearest $\frac{1}{16}$ of an inch. But since wooden instruments are subject to shrinkage and the loosening of joints, an accurate determination of the original dimensions is impossible.

The radius of Davis quadrants is taken from the focal point indicated on all the instruments examined on the stub for the horizon vane to the extreme edge of the 30° arc. The radius of all octants and sextants is taken from the center of the arm pivot pin to the scale.

Type A verniers are those with 0 at the center. This is the earlier type with one less division than the scale in the same space—they read from 0 to the right then from the left to 0. Type B verniers read from the 0 at the right to the left. It has one more division than the scale in the same space. Type X tangent screw is under the lower edge of the vernier. Type Y is over the lower edge. Type Z is over the upper edge.

A reverse tapered telescope tube is one with its largest diameter at the eye end.

In angular measures, °, indicates degrees; ′, minutes and ″, seconds. In linear measures, ′, indicates feet and ″, inches.

I. Instruments for Location from the Heavens

In this group are the instruments used to obtain the altitudes of celestial bodies and to measure horizontal angles between objects. These are the basic instruments for the determination of a vessel's position when land is out of sight. The arrangement is chronological, by types and, in so far as possible, within the types.

The most ancient instrument for measuring angles of altitude is the *quadrant* which in its simple form was in use centuries before our era. After the Renaissance many improvements were made, but it was still being offered by instrument dealers in the nineteenth century, and in fact during World War II it was being used for survival navigation.

Next came the *astrolabe*, apparently developed by Arab astronomers, the earliest known dated instrument being one made in the tenth century, once in the Michel collection. Generally speaking there are two forms, the one used by astronomers, and the other, a much less complicated device, used by mariners. Four of the former are in the Museum Collection; unfortunately we lack one of the latter.

After the *astrolabe*, and again following an Arab device, the Kamal, the *cross staff* appeared, the first western description of one coming from Levi ben Gerson in 1342. The Museum is fortunate in owning two of these rare instruments. Developed from this device was the *back staff*, or *Davis quadrant*, named for Captain John Davis, the English explorer, who designed the most popular form about 1595. Our collection of these is outstanding, and includes a signed and dated piece made in Boston, which is one of the oldest known Davis quadrants extant.

In 1732 the prototype of the modern sextant was devised simultaneously by John Hadley in England and Thomas Godfrey in Philadelphia. Generally known as the "Hadley quadrant," or octant, because his design, more compact and of simpler construction than Godfrey's, was used, the instrument became the standard equipment of most Occidental navigators. About mid-century when the lunar-distance method of finding longitude was proposed, the need for an instrument capable

of measuring angles greater than the 90° of the Hadley quadrant was seen. Therefore, the *circle* and finally the *sextant* were designed: the first by Tobias Mayer in 1752, the second by Capt. John Campbell, R.N. about 1757. Many improvements such as telescopic sights, better frames, verniers, eye shades, bubble horizons, illuminated arcs, and the like have been added, but the basic instrument has remained the same. It is interesting to note that the most modern in the Collection, the United States Navy's "Ball Recording Sextant," is actually a return to the earliest instrument, the plane quadrant.

The need of an *artificial horizon* for use with the Hadley quadrant was soon felt, because even though the sun might be clear and bright overhead, low lying fog obscured the natural horizon, thus preventing an observation. All sorts of devices, such as mirror-capped spinning tops, bowls of molasses and even mirror-topped pendulums were tried. The earliest modern mercury type was made for Capt. James Cook in 1771.

A. Quadrants

1 English, early eighteenth century. Made of boxwood 3¾″ radius over-all, sights missing. Gunter's design engraved on face; reverse unmarked. Plumbbob not original.
Plate I M3062

2 American, 1775. Made of pine covered with paper 5¾″ radius over-all. Broken wooden sights. Plumbbob missing. Face inscribed "MH Delineated at Danvers Janry 3d 1775"; reverse "Sic transit Gloria Mundi." Drawn on face in colored inks is Gunter's quadrant design, and on reverse a declination diagram for mean and leap years. Plate I M10360

3 American, 1792. Made of mahogany, brass sights, lead plumbbob, 9⅞″ radius over-all. Inscribed "N Bowditch at Salem 1792 August 20th." Face, quadrant graduated to 1° with sun dial, tables of solar declination, sun rise and sun set. Reverse, graduated to 1° with sun dial and tidal computer with slide rule for moon's age between 1789 and 1799. Plate I M9819

Designed and made by Nathaniel Bowditch at the age of nineteen.

4 American, 1944. Frame alloy, radius approximately 4¼″. Name plate marked "Ball Recording Sextant Mark I Mod. O. U. S. Navy Bu Ships. N3768 1944 Mergenthaler Linotype Company, Brooklyn, New York." Scale on frame graduated 0° to 90° by 1°. Drum micrometer vernier, reading to .1′. Sight vane for telescope. Hard rubber handle. Mahogany box equipped with: two telescopes with built in screens 9″ long, one marked "Day," one "Night"; one Instruction Book. Label in box: "Certificate of Eccentricity" from U. S. Naval Observatory.

Plate XIV M10994

This instrument is actually a highly developed quadrant for use at night or when no horizon is visible. The object is viewed directly, without a reflecting mirror; and instead of a plumbbob, a falling steel ball records the altitude on a screen, the record being read with a drum micrometer in minutes and tenths of minutes.

B. Astrolabes

5 French or Italian, mid-sixteenth century. Brass unsigned. Rete for forty-eight stars, one double tympan marked 41 and 43. Vernal equinox 11½ March. Alidade is of an uncommon shape. Pivot a replacement. Diameter 9½″.

Plate II & III M10977

6 Italian, after 1582. Iron. A very unusual instrument with Zodiac reversed and vernal equinox 21 March. One rete, no star index. No tympans. Pivot a replacement. Arms of City of Gloucester, England, engraved on reverse. Diameter 8⅝″.

Plates II & III M10976

7 English, early-seventeenth century. Brass unsigned, on the de Roias projection. Diameter $8\frac{9}{16}$″.

Plates II & III M9450

Once owned by Nathaniel Bowditch.

8 Indo-Persian, mid-seventeenth century. Brass unsigned, but possibly by Muhammad Maqim at Lahore. Rete for thirty-three

stars. Four double tympans. The alidade is perhaps a late and incorrectly designed replacement. Diameter $8\frac{8}{16}$".
Plates II & III M2560

C. Cross Staves

9 American (?), 1718. Ebony ½" square, 36" long. Marked "Edward Holyoke 1718." Another marking illegible with date possibly 1666. Side one divisions illegible. Side two divided in inches. Sides three and four show illegible markings. Fitted with a "Dutch Shoe" made of pearwood. One cross made in Museum. Plate V M8727

Willed to Dr. Edward Augustus Holyoke by his father, Edward Holyoke (President of Harvard, Pastor of the Second Church, Unitarian of Marblehead), and in the family until placed in the Museum.

See: "Notes on the Cross-Staff," *The American Neptune:* XIV, July 1954, pp. 187-191; and "Four American Cross-Staves," *The American Neptune:* XIX, April 1959, pp. 138-140.

10 American (?), 1748. Ebony, ⅝" square, 32⅞" long. Eye end chamfered. Outer end stamped "10." Side one divided 90° to 35° subdivided 15′ to 80° and 10′ below. Side two divided 90° to 25° subdivided 30′ and 60° and 10′ below. Side three divided 60° and 13° subdivided to 30′ to 30° and 10′ below with 90° check point. Side four divided 30° to 6° subdivided 30′ to 20° and 10′ below with 90° and 60° check points. Four crosses made in Museum. Plate IV M7799

D. Davis Quadrants

11 American, 1676. Made entirely of pearwood. 60° arc divided by degrees 62° on arc 3° on limb marked for both altitude and zenith distance. 30° arc divided to 10′ diagonal scale to 1′, with both altitude and zenith distance numbering. Radius 29½". Individual letter stamps on the horizon limb read "MADE BY JAMES HALSEY FOR THOMAS SWETT [or SMITH] 1676." A split in the upper end of the 30° arc has been beautifully repaired with

two brass plates. A paper label pasted on reads "A Davis's Quadrant made of a pear tree in 1676 by J. Halsey of Boston, the first Instrument maker in America. Gift of Mr. Andrew Newall [sic] [to the Massachusetts Historical Society] April 30 1793."
Plate VI M10525

12 English, 1719. Rosewood limbs, boxwood arcs, braces 60° rosewood, 30° boxwood. Boxwood plate inlaid on limb marked "Made by Benj. Macy for Capt. Walter Hogg, 1719." Instrument not numbered. 30° arc, 23⅞″ radius, divided 25° divided by 1° subdivided by 10′ subdivided 5′. Diagonal scale to 1′ with 90°–65° altitude numbering. On reverse of the arc is engraved tables of solar declinations, place in zodiac and right ascension. 60° arc, 62° on scale 3° on limb divided by 1°, rim divided 5°. No vanes. Reverse scale. Plate VII M9187

13 American, 1740. Rosewood limbs, boxwood arcs, braces 60° rosewood, 30° boxwood. Marked on brace "Thos. Greenough, fecit 1740, for David Miller." Instrument not numbered. 30° arc, 23½″ radius, 25° divided by 1° subdivided to 10′. Diagonal scale to 2′, with 90°–65° altitude numbering. 60° arc, 62° on scale divided by 1°. Three original vanes include magnifying shade vane; horizon vane with sun spot for lower limb; and sight vane. M9453

At one time owned by Nathaniel Bowditch.

14 American, c. 1750. Rosewood limbs and braces, boxwood arcs. Instrument marked "A[nthony] L[amb] 1016″ on handle. Unmarked ivory plate and five fancy ivory diamonds inlaid on limbs. 30° arc, radius 21⅛″, 25° divided by 1°, subdivided to 5′, diagonal scale to 1′ with 90°–65° altitude numbering. 60° arc, 61° on scale divided by 1°, rim by 5° with semi-diameter correction. No vanes. M1933

15 American, 1768. Ebony limbs, boxwood arcs, braces 60° ebony, 30° boxwood, marked "Made by Wm. Williams in King Street Boston," bone plate marked "for Malchi Allen 1768" on upper limb. Five inlaid bone diamonds. No instrument number.

Magnifying glass shade vane and sight vane original; horizon vane a replacement. 30° arc, radius 22″, 25° divided by 1° subdivided 10′, diagonal scale to 1′, with 90°–65° altitude numbering. 60° arc, 62° on scale, divided by 1°. M471

Mal[a]chi Allen was a Massachusetts ship-master as early as 1743.

16 American, 1775. Rosewood limbs, boxwood arcs, braces 60° rosewood, 30° boxwood. Marked on 30° brace "Benja King Fecit Salem New England 1775." Name plate on limb missing. Instrument numbered "500." 30° arc, radius 22¾″, 25° divided by 1° subdivided to 10′, subdivided to 5′, and 5° minus scale, same division and subdivisions. Diagonal scale to 1′ with 90°–65° altitude numbering. 60° arc, 62° on scale, 3° on limb divided by 1°. No vanes. Plate VIII M3061

17 American, 1775. Ebony limbs, boxwood arcs, braces 60° rosewood, 30° boxwood. 30° brace marked "Made by W^m^ G. Haggar in Newport Rhode Island 1775." Fancy ivory plate inlaid on upper limb marked "Daniel Fish." Instrument numbered "344." 30° arc, 23⅜″ radius, 25° divided by 10° subdivided by 10′, diagonal scale to 1′ with 90°–65° altitude numbering. 60° arc, 62° on scale 3° on limb divided by degrees. No vanes. M850

18 English, eighteenth century. Rosewood limbs and braces, boxwood arcs. Boxwood name plate marked "Made by John Gilbert Tower Hill London" inlaid on limb. Instrument numbered "1448." Three original vanes each stamped "1448," shade vane solid, horizon vane has sun spot for semi-diameter. 30° arc, radius 24″, divided 25° by 1°, subdivided 5′. Diagonal scale to 1′ with 90°–65° altitude numbering. 60° arc, 62° divided on the scale by 1°, with 3° on the limb, rim divided by 5° with semi-diameter correction. M33

19 English, eighteenth century. Rosewood limbs and braces, boxwood arcs. Boxwood name plate marked "I. Hutchins, St. Catherines London" inlaid on upper limb. Instrument numbered "70." 30° arc, 23$\frac{13}{16}$″ radius, divided 25° by 1°, subdi-

vided to 5′. Diagonal scale to 1′ with 90°–65° altitude numbering. 60° arc, divided 62° on scale, 3° on limb by 1°, rim divided by 5° with semi-diameter correction. No original vanes. M31

20 Origin and date unknown. Ebony limbs and braces, boxwood arcs. Ivory plate inlaid on limb unmarked. Instrument numbered "60." Horizon vane, sun spot altered or added for semi-diameter, numbered "60," magnifying vane, glass missing, stamped "IP 1228." 30° arc, radius 21″, 25° divided 1° subdivided 10′ subdivided 5′. Diagonal scale to 1′ with 90°–65° altitude numbering. 60° arc, 62° on scale divided by 1°, 3° on limb, rim divided by 5° with correction for semi-diameter. Plate missing on reverse of 60° arc brace. M9186

21 Probably American, date unknown. Birch or beech limbs and braces, boxwood arcs. Unmarked ivory plate inlaid on limb. Instrument numbered "113." Four original vanes; horizon has semi-diameter sun spot, solid shade vane, typical sight vane, all stamped "113," magnifying glass vane unmarked. 30° arc, radius $23\frac{1}{16}$″, 25° divided by 1°, subdivided by 10′. Diagonal scale to 2′ with 90°–65° altitude numbering. 60° arc, 62° on scale, 3° on limb, divided by 1°, rim divided by 5° with semi-diameter correction. The stamps used to mark and decorate scales are the same as those used by Thomas Greenough of Boston on M9453. Plate VII M3000

See: "The Back Staff," *The American Neptune:* XXI, April 1961, pp. 107-109.

E. Hadley's Quadrants or Octants

22 American, 1755. Frame mahogany, radius 20″. Name plate ivory marked "Made by John Dupee 1755 for Patreck Montgomerie." Limb boxwood, two pieces, joined at 45° point. Scale engraved on limb graduated 0° to 90° by 1° subdivided to 20′, diagonals to 1′ with zenith numbering. Flat mahogany index arm inlaid ivory "line of faith" over the scale. Adjustable index mirror with two removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double

peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment. Step pine box, painted black.

Plate IX M1034

Identical size, hardware, marking stamps and material with M9270 except the brace is straight. Montgomerie was a well-known Massachusetts ship-master and owner in the mid-eighteenth century.

23 English, 1758. Frame mahogany, radius 14¾″. Name plate marked "Made by Jno Gilbert on Tower Hill London for Stephen Hughes Augt 18 1758." Limb boxwood. Scale engraved on limb graduated −5° to 95° by 1° subdivided to 20′. Flat mahogany index arm with brass lower end. Vernier missing. Adjustable index mirror with two removable shades. Horizon glass with lever adjustment. Sight vane double peep with pivoted cover. Plate IX M4316

24 American, 1760. Frame mahogany, radius 20″. Name plate ivory marked "Captn Hugh Mc Lean 1760." Limb boxwood, two pieces, joined at 45° point. Scale engraved on limb graduated 0° to 90° by 1° subdivided to 20′, diagonals to 1′ with zenith numbering. Flat mahogany index arm with inlaid ivory "line of faith" over scale. Adjustable index mirror (missing) with two removable shades (broken). Horizon glass with lever adjustment. Sight vane double peep with pivoted cover (damaged). Back sight with single peep. Back horizon with lever adjustment, shades from index mirror. M9270

Identical in size, hardware, marking stamps and materials with M1034 made by John Dupee, except the brace is an arc. Hugh Mc Lean was a Boston ship-master and owner in the mid-eighteenth century.

25 English, c. 1760. Frame mahogany, radius 17⅞″. Name plate marked "J. Urings London." Limb mahogany. Scale inlaid boxwood graduated 0° to 90° by 1° subdivided to 20′, diagonals to 1′ with zenith numbering. Flat mahogany index arm. Adjustable index mirror with removable shades (missing). Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep. Back sight with single peep. Back horizon with lever adjustment. M2715

26 English, c. 1760. Frame cast brass, radius 17¼″. Frame marked "J. Urings London." Limb brass. Scale engraved on limb graduated −5° to 95° by 1° subdivided to 20′. Flat brass index arm. Brass vernier type A, reading to 1′. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight broken. Back horizon with lever adjustment. Removable handle missing. Step box, mahogany top, painted black, pine case lined with heavy red woolen cloth.

Plate X M1851

27 English (?), c. 1760. Frame mahogany, radius 17⅞″. Name plate missing. Limb mahogany. Scale ivory graduated −5° to 95° by 1° subdivided to 20′. Flat mahogany index arm with brass end. Ivory vernier type A, reading to 1′. Adjustable index mirror with two removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment, shades from index mirror. M1276

28 French, c. 1760. Frame mahogany, radius 13″. Name plate ivory marked "S.B." in inlaid brass wire. Limb mahogany, top covered with sheet brass. Scale engraved on limb graduated −5° to 95° by 1° subdivided to 30′. Flat brass index arm. Brass vernier type A, reading to 1′. Adjustable index mirror, shades missing. Horizon glass with lever adjustment, shades none fitted. Sight vane missing. Pine box, painted yellow. Label in box; engraved: "Joseph Roux Fils Aine et Comp. Ingenieurs hydrographes, sur le Port vers St. Jean, Font et Vendent toutes sortes de Boussoles, Compas d'azimuth et autres, sabliers de toutes qualities, Sextans, Octans de nonante, Fleches, Telescopes, Lunettes accromatiques de differentes lengeurs, Lunettes de Nuit, Lorgnettes d'Opera, Compas a pointer, Echelles Anglaises, Etuis de Mathematique.

"Ils sont assortis en toilles et etoffes de lains et de cotton pour les Pavillons ainsi qu'en Portolans, Plans de Port et Cartes hydrographiques de tous les auteurs quelconques a Marseille."

Plate X M852

29 English, c. 1763. Frame mahogany, radius 17⅞″. Name plate marked "Made by Jno Gilbert on Tower Hill London For Hector Orr Augst 6: 1763." Limb mahogany. Scale inlaid ivory graduated −5° to 95° by 1° subdivided to 20′, with both altitude and zenith numbering. Flat mahogany index arm with brass end. Ivory vernier type A, reading to 1′. Adjustable index mirror with two removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane single peep. Back sight missing. Back horizon with lever adjustment.

Plate XI M1023

30 English, 1772. Frame mahogany, radius 20″. Name plate ivory marked "Arthur Ryburn 1772." Limb boxwood marked "Sterrop London." Scale engraved on limb graduated −20′ to 90° by 1° subdivided to 20′, diagonals to 1′ with zenith numbering. Flat mahogany index arm with inlaid ivory "line of faith" over the scale. Adjustable index mirror with two removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane damaged. Back sight with single peep. Back horizon with lever adjustment. Plate XII M1022

31 English, 1773. Frame ebony, radius 15⅜″. Name plate ivory marked "Made by Thos Ripley ty[e] [sic] Hermitage London for Iohn Ness Feby 19, 1773." Limb ebony. Scale inlaid ivory, damaged, graduated ? to 95° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type A, reading to 1′. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment. Step pine box, painted yellow.

Plate XII M5180

Ivory note plate on back of frame; pencil hole in brace.

32 Nationality unknown, 1778. Frame ebony, radius 14⅝″. Name plate ivory marked "Joseph. Peabody. 1778." Limb ebony. Scale ivory graduated −5° to 95° by 1° subdivided to 20′. Flat ebony and brass index arm. Ivory vernier type A, reading to 1′. Adjustable index mirror with two removable shades. Horizon

glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment. Modern mahogany box with brass plate "Joseph Peabody Esq Salem 1778."

M10657

Ivory note plate on back of frame; pencil hole in brace. Joseph Peabody (1757-1844) was one of Salem's most prominent shipping merchants. The quadrant dates from his privateering days during the War for Independence.

33 English, 1779. Frame ebony, radius 13⅝". Name plate ivory marked "Made by Jno Gilbert Tower Hill London For Capt Peter Baird Dec^{r} 17th 1779." Limb ebony. Scale ivory graduated −5° to 95° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type A, reading to 1′. Adjustable index mirror with three fixed shades. Horizon glass with lever adjustment. Sight vane single peep. Step pine and oak box. M9274

34 Nationality unknown, c. 1780. Frame mahogany, radius 17¾". Name plate ivory with markings scraped off. Limb mahogany. Scale ivory in two pieces graduated −5° to 95° by 1° subdivided to 20′. Mahogany index arm with brass end. Ivory vernier type A, reading to 1′. Adjustable mirror with two removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with cover. Back sight damaged. Back horizon with lever adjustment. M6600

Ivory keystone note plate on back of frame; pencil hole in brace.

35 English, c. 1780. Frame ebony, radius 17¾". Name plate ivory marked "G. Adams Fleet Street London." Limb ebony. Scale ivory graduated −5° to 95° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type A, reading to 1′. Adjustable index mirror with removable shades, missing. Horizon glass with lever adjustment. Sight vane double peep covered with leather for Arctic use. Back sight with single peep. Back horizon with lever adjustment. Step mahogany box. M1852

Box has decorations and "Henry Barr Salem Massatts United States of America," painted on the cover. Very large ivory note plate on back of frame.

36 English, c. 1780. Frame ebony, radius 13⅞″. Name plate ivory marked "Made by Richd Lekeux No 137 near Execution Dock Wapping London." Limb ebony. Scale ivory graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep. Back sight vane missing. Back horizon glass with lever adjustment.

M1932

Owned by Nathaniel Bowditch. Ivory note plate on back of frame; ivory-topped pencil in brace.

37 Nationality unknown, 1781. Frame mahogany, radius 17¾″. Name plate ivory marked "David Young junior 1781." Limb mahogany. Scale ivory graduated −5° to 95° by 1° subdivided to 20′. Flat mahogany index arm with brass end. Ivory vernier type A, reading to 1′. Adjustable index mirror with two removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep, cover missing. Back sight with single peep. Back horizon with lever adjustment. Step pine box, painted cream with black oval holding name "A. Dodge" in cream. M439

This instrument has a very old break in the frame, carefully repaired with a mahogany "fish" and twine seizings.

38 Irish, 1784. Frame mahogany painted black, radius 15¾″. Name plate ivory marked "Made by Francis Fitton Cork For Captn Abel Orpin 1784." Limb mahogany. Scale ivory graduated −5° to 95° by 1° subdivided to 20′, with both zenith and altitude numbering. Flat brass index arm. Ivory vernier type A, reading to 1′. Adjustable index mirror with two removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep. Back sight with single peep. Back horizon with lever adjustment. Step mahogany box equipped with a 2″ magnifier in a horn folding case.

Plate XI M3275

Ivory note plate on back of frame; pencil hole in brace.

39 French, c. 1786. Frame brass, radius 9⅜″. Frame marked "Dedie a Sa Maieste Louis XVI Fait Par Magnie a Dunkerque." Scale on frame graduated −5° to 95° by 1° subdivided to 20′. Brass index arm. Brass vernier type A, reading to 1′. Tangent screw Y. Adjustable index mirror (missing) with two removable shades. Horizon glass with screw adjustment. Sight vane for telescope, one draw. Mahogany handle. Equipment a magnetic compass, 2″ diameter, needle missing, is incorporated in the frame. Frontispiece M10975

This is certainly the most beautiful Hadley Quadrant in the Collection. The frame has been damaged but very skillfully repaired. A pivoted peep hole cover for the sight vane originally fitted is now missing.

40 English, c.1790. Frame ebony, radius 16″. Name plate ivory with markings scraped off. Limb ebony. Scale inlaid ivory graduated −5° to 95° by 1° subdivided to 20′, with both altitude and zenith numbering. Flat brass index arm marked "J. C." [James Chapman] in fancy script above the vernier. Ivory vernier type A, reading to 1′. Tangent screw Y. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment. Step oak and pine box. M6211

Ivory note plate on back of frame; pencil hole in brace; arm decorated with engraved ship under sail and floral designs.

41 English, c. 1790. Frame ebony, radius 15⅛″. Name plate ivory marked "William [illegible]." Limb ebony. Scale ivory graduated −5° to 95° by 1° subdivided to 20′. Flat brass index arm marked "J. C." [James Chapman] in fancy script. Ivory vernier type A, reading to 1′. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight vane with single peep. Back horizon with lever adjustment. Step pine box, painted green. Labels in box: "Gedney King... 118 State Street, Boston"; "John H. Wheeler, Real Manufacturer of Mathematical & Optical Instruments N°

150 Front Street, New York . . . J. H. Wheeler being a Practical Workman is enabled to supply Dealers . . . Ship Chandlers with Warranted Instruments as low as they can Import."

Plate XVIII M2401

Ivory note plate on back of frame; pencil hole in brace.

42 Nationality unknown, c. 1790. Frame ebony, radius 16″. Name plate missing. Limb ebony. Scale ivory graduated −4° to 94° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type A, reading to 1′. Adjustable index mirror with removable shades, missing. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight missing. Back horizon with lever adjustment. M3040

Large ivory note plate on back of frame; pencil hole in brace.

43 Scotch, c. 1790. Frame mahogany, radius 16$\frac{1}{16}$″. Name plate missing. Limb mahogany. Scale inlaid ivory graduated −4° to 94° by 1° subdivided to 20′, with both altitude and zenith numbering. Flat brass index arm marked "Gardner Glasgow." Ivory vernier type A, reading to 1′. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight missing. Back horizon with lever adjustment. M865

Ivory note plate on back of frame missing. Index arm decorated with engraved swags and arabesques. Pencil hole in brace.

44 Nationality unknown, c. 1800. Frame ebony, radius 15$\frac{5}{8}$″. Name plate unmarked. Limb ebony. Scale ivory graduated −4° 40′ to 99° 40′ by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted ruby glass cover. Back sight with single peep. Back horizon with lever adjustment. Step pine box, painted cream. Labels in box: "Samuel Thaxter 49 State Street Boston . . ."; "John Jayne Mathematical Instrument Maker Essex Street Salem

Quadrants & Compasses Cleaned & Repaired at the shortest Notice Orders Gratefully received and Punctually executed."

M5182

45 English, c. 1790. Frame ebony, radius 15¾". Name plate ivory unmarked. Limb ebony. Scale ivory marked "SBR" graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment. Step pine box, painted green. Labels in box: "Alex^{r} Megarey, N-York, 238 Water St. makes in the most accurate manner . . . Ships Compasses, Sextants, Quadrants, Telescopes, Time Glasses . . ." M2781

Ivory note plate on back of frame; pencil hole in brace.

46 English, c. 1790. Frame ebony, radius 15¾". Name plate ivory marked "Spencer Browning and Rust London." Limb ebony. Scale ivory graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm decorated with an engraved floral design. Ivory vernier type B, reading to 1′. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment. Step mahogany box. Label in box: Damaged "Gedney King no 95 [State Street] Boston." Plate XIII M41

Note plate on back of frame missing; ivory top of pencil missing. The braces are carved with intertwined sea serpents, a conventional dolphin, a sun burst, all enclosed in rope borders. There is an unmarked ivory oval plate inlaid in the vertical brace.

47 English, c. 1790. Frame ebony, radius 15¾". Name plate ivory unmarked. Limb ebony. Scale inlaid ivory marked "G[foul anchor]W" graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane

double peep with pivoted cover. Back sight missing. Back horizon with lever adjustment. M2536

Note plate on back of frame missing; pencil hole in brace.

48 Nationality unknown, c. 1790. Frame ebony, radius 14″. Name plate missing. Limb ebony. Scale ivory graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Adjustable index mirror with removable shades, missing. Horizon glass with lever adjustment and shades from index mirror, missing. Sight vane double peep with pivoted cover. M9181

Note plate on back of frame missing; pencil hole in brace.

49 English, c. 1790. Frame ebony, radius 13¾″. Name plate ivory marked in script "J. Oliver J. Oliver." Limb ebony. Scale ivory, damaged, marked "[foul anchor]F" graduated −2° to ? by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment. M10658

Jacob Oliver was a Beverly ship-master, late eighteenth century.

50 Nationality unknown, c. 1790. Frame mahogany, radius 13⅞″. Name plate missing. Limb mahogany. Scale inlaid ivory graduated −2° to 98° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Index mirror, missing, with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight broken. Back horizon with lever adjustment. M9821

Index arm decorated with engraved masonic emblems, swags and flowers. Ivory note plate on back of frame; pencil hole in brace.

51 English, c. 1794. Frame ebony, radius 15″. Name plate marked "Made by Iames Chapman St Catherines London for William

Hunt 1794." Limb ebony. Scale inlaid ivory graduated −2° to 99° 40′ by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment with locking screw and shades from index mirror. Sight vane double peep with pivoted cover. Back sight removed. Back horizon removed. M2028

Ivory note plate on back of frame; pencil hole in brace.

52 English, c. 1800. Frame ebony, radius 13¾″. Name plate missing. Limb ebony. Scale ivory graduated −3° to 99° by 1° subdivided to 20′. Flat brass index arm marked "[foul anchor]." Ivory vernier type B, reading to 1′. Adjustable index mirror with three removable shades, one missing. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with cover. Back sight missing. Back horizon with lever adjustment. M8859

Note plate on back of frame missing; pencil hole in brace.

53 English, c. 1800. Frame mahogany, radius 15¾″. Name plate missing. Limb mahogany. Scale ivory marked "SBR" graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm marked with scratched letters "S.P.F." Ivory vernier type B, reading to 1′. Adjustable index mirror with removable shades, missing. Horizon glass with lever adjustment and shades from index mirror, missing. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment, mirror and cover, missing. Varnished step pine box.

Plate XIX M42

S[ylvester] P. F[ogg] was a Salem ship-master in 1829.

Ivory note plate on back of frame; pencil hole in brace. Box top decorated with a good portrait in oils of George Washington, wreath border and inscription "First in War First in Peace...." Interior of box top has another portrait of Washington; six other heads, an eagle, flower piece, two bows of vessels, several verses, latitude calculations, etc. in pencil. The bottom has similar materials in pencil including "Ship Hercules."

54 English, c. 1800. Frame ebony, radius 13⅝″. Name plate ivory marked "Spencer Browning & Rust London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 100° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with three removable shades. Horizon glass with thumb screw and lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment. Step oak box, painted black. Label in box "William [Hooker] Water, Corner of ? Streets New [York] (Old Stand)..." M3736

Ivory note plate on back of frame; ivory-topped pencil in brace.

55 English, c. 1800. Frame ebony, radius 11⅝″. Name plate ivory marked "Spencer Browning & Rust London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight missing. Back horizon with lever adjustment. Step oak box, painted black. Label in box: "Sam[l] Thaxt[er and S]on Mathematical [?] makers No. [?] State Street Boston..." On this is written once in pencil, once in ink, "Capt Snell." M5181

Note plate on back of frame missing; pencil hole in brace.

56 English, c. 1800. Frame ebony, radius 11⅝″. Name plate ivory marked "Spencer Browning & Rust London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 99° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment and three fixed shades. Sight vane for telescope with pivoted cover single peep. Step keystone oak box, painted black. Labels in box: "S. Emery, Salem." In ink, "Repaired by ? March 21, 1868"; in pencil "1336," "1614"; "H. Duren, New

York"; "S. Emery Salem"; another of "S. Emery, Salem"; fragments of another label, indecipherable. M5802

Ivory note plate on back of frame; pencil hole in brace.

57 English, c. 1800. Frame ebony, radius 11⅝". Name plate ivory marked "Spencer. Browning & Rust London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 99° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment and two fixed shades. Sight vane double peep with pivoted cover. Step oak box equipped with: adjusting key. Label in box: "David Baker Nautical Instrument Maker, No. 44 Water Street New-Bedford . . ." Plate XVIII M5962

Ivory note plate on back of frame; pencil hole in brace.

58 English, c. 1800. Frame ebony, radius 11⅝". Name plate ivory marked "Spencer Browning & Rust London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 99° 40′ by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with three removable shades. Horizon glass with thumb screw and lever adjustment and three fixed shades with circular frames on one post screwed in the old mortice for the removable index shades. Sight vane for telescope with pivoted cover, single peep. Back sight with single peep. Back horizon with lever adjustment. Step oak box, painted green equipped with an adjusting tool and fitted for missing telescope. M29

Ivory note plate on back of frame; pencil hole in brace.

59 English, c. 1800. Frame ebony, radius 11⅝". Name plate missing. Limb ebony. Scale ivory marked "SBR" graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with three removable shades. Horizon glass with key and lever adjustment and shades from index mirror. Sight vane

double peep with pivoted cover. Back sight broken. Back horizon with lever adjustment. M10659

Note plate on back of frame, missing; pencil hole in brace.

60 English, c. 1800. Frame ebony, radius 13⅝″. Name plate ivory marked "Spencer Browning & Rust London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Adjustable index mirror with removable shades, missing. Horizon glass with lever adjustment and shades from index mirror, missing. Sight vane double peep with pivoted cover. Back sight missing. Back horizon with lever adjustment, mirror and frame missing. Step pine box, painted green. Label in box: painted over, but of Richard Patten. M949

Note plate on back of frame missing; pencil hole in brace.

61 English, c. 1800. Frame ebony, radius 13⅝″. Name plate marked "Spencer Browning & Rust London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 99° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with removable shades, missing. Horizon glass with thumb screw and lever adjustment and shades from index mirror, missing. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment. M2537

Note plate on back of frame; pencil hole in brace.

62 English, c. 1800. Frame ebony, radius 13⅝″. Name plate ivory. Limb ebony. Scale ivory marked "SBR" graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with three removable shades. Horizon glass with thumb screw and lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment. Step oak box. Label in box: "Samuel Emery Water Street Salem." M636

Ivory note plate on back of frame; ivory-topped pencil in brace.

63 English, c. 1800. Frame ebony, radius 11⅜″. Name plate marked "Spencer Browning Rust London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 99° by 1° subdivided to 20′. Brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with three removable shades. Horizon glass with screw adjustment and shades from index mirror. Sight vane double peep with pivoted cover, damaged. Back sight with single peep. Back horizon with lever adjustment. Step keystone pine box, painted black. Labels in box: "Gedney King & Son 7 Broad St. Boston"; "Parkinson & Frodsham . . . 54 Castle Street, Liverpool"; Indecipherable; "J. Foster. Optician, Stationer and Printer 70 Sparling Street, Liverpool." M11022

Ivory keystone note plate on back of frame; ivory-topped pencil in brace.

64 English, c. 1800. Frame ebony, radius 13¾″. Name plate marked "Dring & Fage Makers London." Limb ebony. Scale ivory marked "D [foul anchor] F" graduated −2° to 98° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with removable shades, missing. Horizon glass with thumb screw and lever adjustment and shades from index mirror, missing. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment. Step oak box painted green. Labels in box: two of "Dring & Fage Hydrometer Makers to His Majesty's Honble Board of Excise, 320 Tooley Street 2 doors from London Bridge . . ."; "Thomas Jones (From the Minories London) Sextant, Quadrant, Compass, and Telescope Maker, 5 Harrington Street, Castle Street, near the Exchange, Liverpool. . . ." M3477

Ivory note plate on back of frame; pencil hole in brace.

65 English, c. 1800. Frame ebony, radius 13⅞″. Name plate missing. Limb ebony. Scale inlaid ivory graduated −3° to 98° by 1° subdivided to 20′. Reinforced brass index arm marked "J. & I. Hardy London." Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with removable shades, miss-

ing. Horizon glass with thumb screw and lever adjustment and shades from index mirror, missing. Sight vane double peep with pivoted cover. Back sight missing. Back horizon, missing.

Note plate on back of frame, missing; pencil hole in brace. M2359

66 English (?), c. 1800. Frame ebony, radius 13⅞″. Name plate ivory. Limb ebony. Scale ivory graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane missing. Back sight with single peep. Back horizon with lever adjustment. Step pine box. Label in box: "Samuel Emery Mathematical Instrument Maker Water Street Salem N B Orders thankfully received and punctually executed. Callender Sc." M45

The name "John C. Pulsifer, Essex St Salem" written in pencil in box cover. Ivory note plate on back of frame; pencil hole in brace.

67 English, c. 1800. Frame ebony, radius 11⅝″. Name plate ivory. Limb ebony. Scale ivory marked "[foul anchor]?" graduated −2° to 99° 40′ by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment and three fixed shades. Sight vane double peep with pivoted ruby glass cover. Step pine box. Label in box: "Samuel Emery Water Street Salem." M1675

The scale shows the impression of a wheel tool used to divide the scale. Ivory note plate on back of frame; pencil hole in brace.

68 English, c. 1818. Frame ebony, radius 11⅝″. Name plate ivory marked "Thomas Jones Liverpool" "Nathaniel Warner." "1818" in a small scrimshawed sperm whale. Limb ebony. Scale ivory marked "[foul anchor]" graduated −2° to 99° 40′ by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three removable shades. Horizon glass with thumb

screw and lever adjustment and shades from index mirror. Sight vane double peep with pivoted ruby glass cover. Back sight with single peep. Back horizon with lever adjustment. Keystone pine box, painted black. M8732

Ivory note plate on back of frame; pencil hole in brace.

69 English, c. 1820. Frame ebony, radius 12″. Name plate ivory marked "Spencer Browning & Rust London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Adjustable index mirror with removable shades, missing. Horizon glass with lever adjustment and shades from index mirror, missing. Sight vane double peep with pivoted cover. Back sight missing. Back horizon with lever adjustment.

Ivory note plate on back of frame; pencil hole in brace. M9271

70 English, c. 1820. Frame ebony, radius 11¾″. Name plate ivory marked "Hughes London." Limb ebony. Scale ivory marked "[anchor]" graduated −2° to 104° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with three removable shades. Horizon glass with thumb screw and lever adjustment and shades from index mirror. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment. Step oak box, painted black. M775

Note plate on back of frame missing; pencil hole in brace.

71 English, c. 1825. Frame mahogany, radius 13⅜″. Name plate missing. Limb mahogany. Scale inlaid ivory marked "Rowland Bristol" graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Adjustable index mirror with three fixed shades, one missing. Horizon glass with lever adjustment and fixed shades, missing. Sight vane double peep with pivoted cover. Back sight with single peep. Back horizon with lever adjustment. M1421

Note plate on back of frame missing; pencil hole in brace.

72 English, c. 1830. Frame ebony, radius 11⅝". Name plate ivory marked "Bassnett Liverpool." Limb ebony. Scale ivory graduated −2° to 100° 40′ by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with three removable shades. Horizon glass with thumb screw and lever adjustment and three fixed shades, in the mortice intended for the index shades. Sight vane double peep with pivoted ruby glass cover. Back sight missing. Back horizon with lever adjustment. Step oak box, painted black. Label in box: "Thos. Hemsley & Son 4 King St. Tower Hill, London Opticians and Nautical Instrument Makers. . . ." M3274

The name "Stephen P. Bray 1835" in white letters on top of box. Note plate on back of frame; pencil hole in brace.

73 English, c. 1830. Frame ebony, radius 11⅝". Name plate ivory marked "Bate London." Limb ebony. Scale ivory marked "[foul anchor] A" graduated −3° to 99° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with three removable shades. Horizon glass with lever adjustment and shades from index mirror. Sight vane double peep with pivoted ruby glass cover. Back sight with single peep. Back horizon with lever adjustment. Step oak box, painted green. M2780

Ivory note plate on back of frame; pencil hole in brace.

74 American, c. 1830. Frame ebony, radius 10". Name plate marked "E & G W Blunt." Limb ebony. Scale ivory graduated −2° to 111° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 30". Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass with thumb screw and lever adjustment and three fixed shades. Sight vane for telescope with pivoted cover, single peep. Mahogany handle. M3489

75 American, c. 1830. Frame ebony, radius 9⅝". Name plate ivory marked "E & G W Blunt." Limb ebony. Scale ivory graduated

−2° to 100° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment. Sight vane double peep with pivoted ruby glass cover. Step oak box.

Plate XIII M2246

Ivory note plate on back of frame; pencil hole in brace.

76 Nationality unknown, c. 1830. Frame ebony, radius 10$\frac{3}{16}$″. Name plate missing. Limb ebony. Scale ivory graduated −2° to 99° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with removable shades, missing. Horizon glass with thumb screw and lever adjustment and shades from index mirror and one pivoted fixed shade as an improvement. Sight vane missing. Back sight missing. Back horizon with lever adjustment, shades missing. M3272

Note plate on back of frame missing; pencil hole in brace.

77 English, c. 1830. Frame ebony, radius 9$\frac{5}{8}$″. Name plate ivory marked "Norie & Co. London." Limb ebony. Scale ivory marked "FW" graduated −2° 40′ to 105° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass with thumb screw and lever adjustment and three fixed shades. Sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3$\frac{1}{8}$″ long; one erecting telescope 3$\frac{3}{8}$″ long; one ruby eye piece; one adjusting key; pocket for missing magnifier.

M3735

78 English, c. 1830. Frame ebony, radius 9$\frac{5}{8}$″. Name plate ivory. Limb ebony. Scale ivory marked "? [foul anchor] F" graduated −2° 20′ to 107° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass with thumb screw and lever adjustment and fixed shades, miss-

ing. Sight vane for telescope with pivoted cover single peep. Fixed wooden handle. Keystone mahogany box equipped with: one inverting telescope 3″ long; pockets for telescope and eye piece, both missing. Labels in box: "Bliss & Creighton Chronometer Makers . . . 42 Fulton Street, New York 7 Congress Street, Boston 136 Chestnut Street, Philadelphia 68 Baltimore St. Baltimore"; "D. Eggert & Son. . . . 239 Pearl Street, Head of Burling Slip, New York . . ."; "Gedney King & Son . . . N° 7 Broad Street Boston . . ." M3276

79 English, c. 1830. Frame ebony, radius 9⅝″. Name plate ivory marked "G. Bradford Minories London." Limb ebony. Scale ivory graduated −3° to 109° 40′ by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment and three fixed shades. Sight vane for telescope with pivoted cover single peep. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3″ long; one erecting telescope 3¼″ long; one ruby eye piece; one key; one magnifier in damaged horn case. M724

80 English, c. 1830. Frame ebony, radius 9⅝″. Name plate ivory marked "Norie & Co London." Limb ebony. Scale ivory marked "ML" graduated −2° 40′ to 107° 40′ by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass with thumb screw and lever adjustment and three fixed shades. Sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one erecting telescope 3⅛″ long; one ruby eye piece; one adjusting key. Pocket for missing magnifier. Label in box: "Samuel Thaxter & Son No. 125 State Street Boston." M723

81 English, c. 1840. Frame ebony, radius 9⅝″. Name plate ivory marked "Spencer Browning & Rust London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 106° by 1° subdi-

vided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass with thumb screw and lever adjustment and three fixed shades. Sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3⅛″ long; one erecting telescope 2¾″ long; one eye piece, glass missing; one adjusting key. Label in box: "Samuel Emery Water Street, Salem." Plate XIV M936

82 English, c. 1840. Frame ebony, radius 9⅝″. Name plate ivory marked "Spencer Browning & Rust London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 106° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror and four fixed shades. Horizon glass with thumb screw and lever adjustment and three fixed shades. Sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3⅝″ long; one erecting telescope 3⅛″ long; one ruby eye piece; one adjusting key; pocket for missing magnifier. Label in box: "S. Emery Salem"; in ink "repaired by April 27 1868." M1148

83 English, c. 1840. Frame ebony, radius 9⅝″. Name plate ivory marked "Spencer & Co. London." Limb ebony. Scale ivory graduated −2° to 107° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier, type B, reading to 30″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass with thumb screw and lever adjustment and three fixed shades. Sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3⅛″ long; one erecting telescope 3⅜″ long; one ruby eye piece; one adjusting key; magnifier in horn case. Label in box: "Samuel Emery Water Street Salem." M3002

84 English, c. 1840. Frame ebony, radius 10″. Name plate ivory marked "Spencer & Co London." Limb ebony. Scale ivory graduated −4° to 108° by 1° subdivided to 20′. Reinforced brass

index arm. Ivory vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror, missing, with four fixed shades. Horizon glass, mirror and cover missing, with thumb screw and lever adjustment and three fixed shades. Sight vane for telescope missing. Wooden handle. M9008

85 Nationality unknown, c. 1840. Frame ebony, radius 9⅝″. Name plate ivory marked "E. A. Emmerton. Dec — Lat D. R—" Limb ebony. Scale ivory graduated −2° 40′ to 106° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass with thumb screw and lever adjustment and three fixed shades. Sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3″ long; one erecting telescope 3¼″ long; one ruby eye piece; a threaded brass plate fitting the sight vane with double peep, engraved "E. A. E." Label in box: "Samuel Emery Water Street Salem." M3270

E. A. Emmerton was a Salem ship-master in the mid-nineteenth century.

86 English, c.1848. Frame ebony, radius 10⅝″. Name plate ivory marked "Spencer Barrett & Co. London." Limb ebony. Scale ivory graduated −2° to 108° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment and one fixed shade. Sight vane double peep with pivoted cover. Keystone mahogany box equipped with: one adjusting tool. Label in box: "S. Emery Salem." M43

Ivory-topped pencil in brace.

87 English, c. 1848. Frame ebony, radius 9⅝″. Name plate marked "Spencer. Browning & Co. London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 104° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with lever adjustment. Sight vane double

peep with pivoted cover. Step oak box, painted black. Label in box: "C. G. King, N° 7 Broad, third Store from State Street, Boston. Importer and Manufacturer of Mathematical, Nautical, Surveying and Guaging Instruments . . ." M3095

Ivory note plate on back of frame; ivory-topped pencil in brace.

88 English, c.1848. Frame ebony, radius 10″. Name plate marked "Spencer, Browning & Co. London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 108° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with lever adjustment. Sight vane double peep. M3273

89 English, c.1848. Frame ebony, radius 9⅝″. Name plate ivory marked "Spencer Browning & Co. London." Limb ebony. Scale ivory marked "SBR" graduated −2° to 104° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment and two fixed shades. Sight vane double peep with pivoted cover. Step oak box with painted initials "M. P. R." equipped with: one adjusting key. Label in box: "Frodsham & Keen, successor to Parkinson & Frodsham, Chronometer Makers to the Rt. Honble the Lords Commissioners of the Admiralty London. No 17 South Castle Street & East Side Salthouse Dock Liverpool Agent in London Fletcher, 48 Lombard Street." M9272

Note plate on back of frame missing; pencil hole in brace.

90 English, c. 1848. Frame ebony, radius 9⅝″. Name plate marked "Spencer-Browning & Co London" "H. Duren New York." Limb ebony. Scale ivory marked "SBR" graduated −2° to 104° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment. Sight vane double peep with pivoted cover. Step oak box, with painted initials "H. C. P."

[Capt. H. C. Perkins]. Labels in box: "Samuel Emery, Water St. Salem," in pencil "Repaired 1827"; "H. Duren, Nautical Instrument Manufacturer 39 Burling Slip, (up Stairs) opposite Fulton Ferry One door from South St. New York"; "[illegible] Nautical Instrument Makers N° 17 rue des Drapeurs Havre . . ." M3610

Note plate on back of frame missing; pencil hole in brace. This box obviously is not the original for the instrument.

91 English, c. 1850. Frame ebony, radius 9⅝". Name plate ivory marked "Hughes. London." Limb ebony. Scale ivory graduated −2° to 99° by 1° subdivided to 20′. Flat brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment. Sight vane double peep with pivoted cover. Step oak box. Label in box: "John Lilley and Son Manufacturers of all sorts of Nautical & Mathematical Instruments Jamaica Terrace, Commercial Road, near the West India Docks, London . . ." M3537

Note plate on back of frame missing; pencil hole in brace.

92 English (?), c. 1850. Frame ebony, radius 9". Name plate ivory marked "Della Torre & C° Halifax & St Johns [sic] N. B." Limb ebony. Scale ivory graduated −3° 4′ to 105° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment. Sight vane double peep with pivoted cover. Keystone mahogany box. Label in box: "F. W. Lincoln Jr & Co . . . 126 Commercial Street Boston." M4015

93 English, c. 1850. Frame ebony, radius 9¾". Name plate ivory marked "J. M. Hyde Maker Bristol." Limb ebony. Scale ivory graduated −3° to 108° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 30". Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass with thumb screw and lever adjustment and three fixed

shades. Sight vane for telescope with pivoted cover single peep. Fixed wooden handle. Keystone mahogany box equipped with: fittings for one telescope; one eye piece; one adjusting screw driver, all missing. Label in box: "George H. Sweetser, dealer in Sextants, Quadrants, Spy Glasses . . . 163 South Street New York." M9273

94 English, c. 1850. Frame ebony, radius 9¾″. Name plate unmarked. Limb ebony. Scale ivory graduated −2° to 100° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment and two fixed shades. Sight vane double peep with pivoted cover. Keystone mahogany box equipped with: one adjusting key. Label in box: "Imray, Son & Compy. Inventors of the Metal Quadrant with Ivory Arch . . . 102 Minories London . . ." M10265

Ivory note plate on back of frame; pencil hole in brace.

95 English, c. 1850. Frame brass, radius 7⅝″. Limb brass marked "Ainsley South Shields." Scale silver graduated −5° to 115° by 1° subdivided to 15′. Reinforced brass index arm. Silver vernier type B, reading to 15″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass with key adjustment and three fixed shades. Sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: magnifier on limb, one shade tube 3″ long; one erecting telescope 3¼″ long; one green eye piece; one adjusting key; one pin; pocket for magnifier missing. Label in box: "F. W. Lincoln Jr. & Co. . . . 126 Commercial Street Boston." M3535

96 English, c. 1850. Frame ebony, radius 8¾″. Name plate ivory marked "Jones Liverpool." Limb ebony. Scale ivory marked "[foul anchor]" graduated −3° to 108° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass with thumb screw and lever adjustment

and three fixed shades. Sight vane for telescope with pivoted cover single peep. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3″ long; one erecting telescope 2¾″ long; one key; pockets for missing magnifier and eye piece. Label in box: "Thomas Tennents Surveying and Navigation Warehouse Fireproof Block, Sign of the Wooden Sailor Cor. Long Wharf and Front St. San Francisco." M3003

97 English, c. 1850. Frame brass, radius 8¾″. Limb brass marked "Jno Dalton Hartlepool." Scale ivory graduated −5° to 110° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with tool adjustment and three fixed shades. Sight vane for telescope. Fixed wooden handle. M7370

98 English, c. 1850. Frame ebony, radius 9 ⅝″. Name plate ivory marked "Melling & Co 36 South Castle St. Liverpool." Limb ebony. Scale ivory graduated −2° to 107° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 30′. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass with thumb screw and lever adjustment and three fixed shades. Sight vane for telescope with pivoted cover single peep. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3⅛″ long; one erecting telescope 3⅛″ long; one ruby eye piece. Labels in box: "Henry Glover, Manufacturers of Chronometers 119 Wall Street, Corner of South Street New-York . . . H. G. having served a regular apprenticeship to Messrs. Parkinson & Frodsham of London, and after fulfilling an engagement with Messrs Arnold & Dent, acted for several years as Managing Foreman and Chronometer-Maker to Messrs Roskell & Sons, Liverpool. . . . One day Chronometers altered to run 56 hours"; "Henry Glover, Manufacturer of Chronometers 116 South Street, near Peck Slip, (Removed from 154 South St) New-York. . . ."; in ink "Cap Price," in pencil "Capt Wm Silver"; fragments of an unidentified label; fragments of a label of an unidentified Liverpool dealer; "Melling & Co. Opticians & Mathematical Instru-

ment Makers, Newton's Head, 39 South Castle Street, Liverpool . . ."; on the reverse is the label of "Geo P. Payne, Optician & Mathematical Instrument Maker, Newton's Head, 39 South Castle Street, Liverpool . . . ," identical in design with the "Melling & Co." label. M853

99 Scotch, c. 1855. Frame ebony, radius 9⅝". Name plate ivory marked "Smith & Ramage Aberdeen." Limb ebony. Scale ivory graduated −4° to 100° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment. Sight vane double peep with pivoted glass (missing) cover. Triangular pine box, varnished. M2245

100 American, c. 1860. Frame ebony, radius 11⅝". Name plate ivory marked "H. Duren New-York." Limb ebony. Scale ivory graduated −2° to 99° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment and one fixed shade, horizontal pivot. Sight vane double peep with pivoted cover. Keystone pine box, painted green with red maltese cross on cover. Label in box: "F. W. Lincoln & Co 126 Commercial St. Boston." M3004

Ivory note plate on back of frame; pencil hole in brace.

101 English, c. 1860. Frame ebony, radius 9¾". Name plate ivory marked "Keohan London." Limb ebony. Scale ivory graduated −2° 40′ to 100° 40′ by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with lever adjustment. Sight vane double peep with pivoted cover. Step oak box, painted black, carved initials "HBP." M3478

Ivory note plate on back of frame has carved initials "HBP"; pencil hole in brace.

H. B. Putnam was a Salem shipmaster by 1850.

102 English, c. 1870. Frame ebony, stamped "IPCS & SS," radius 9⅝". Name plate ivory marked "I. P. Cutts Sutton & Sons Sheffield & London." Limb ebony. Scale ivory marked "S" graduated −2° to 109° 40′ by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment. Sight vane double peep with pivoted cover. Keystone mahogany box equipped with: one tubular pocket $\frac{15}{16}$" inside diameter, use unknown.
M2660

103 English, c. 1870. Frame ebony, radius 10¾". Name plate ivory marked "Callaghan Great Russell St. London." Limb ebony. Scale ivory graduated −2° to 107° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass adjustable with tool and three fixed shades. Sight vane double peep with pivoted cover. Keystone mahogany box equipped with: fittings for magnifier and tool, both missing. M3001

Pencil hole in brace.

F. Sextants

104 English, 1797. Frame ebony, radius 13¾". Name plate ivory, marked "Iames Mc Donald 1797." Limb ebony. Scale ivory marked with foul anchor, graduated −3° to 134° by 1° subdivided to 20′. Reinforced brass index arm, marked "Owens Liverpool." Ivory vernier type B, reading to 30". Tangent screw Y. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment, with three fixed shades. Sight vane for telescope with pivoted peep hole cover. Fixed wooden handle. Plate XV M3343

105 Nationality unknown, c. 1800. Frame brass, radius 11". Limb brass, unmarked. Scale engraved on limb graduated −5° to 140° by 1° subdivided to 15′. Reinforced brass index arm. Brass vernier type B, reading to 15". Tangent screw X. Adjustable index

mirror with four fixed shades. Horizon glass adjustable with tools, shades missing. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3¼″ long; one erecting telescope 3⅜″ long; one inverting telescope with two parallel hairs 6″ long; one eye piece with plain, green and two ruby pivoted shades; one screw driver and pin tool. Magnifier missing. M4171

106 English, c. 1800. Frame ebony, radius 11⅝″. Ivory name plate marked "J. Bleuler London." Limb ebony. Scale ivory graduated −2° to 129° by 1° subdivided to 20′. Reinforced brass index arm. Ivory vernier type B, reading to 1′. Tangent screw Y. Adjustable index mirror with three fixed shades. Horizon glass with thumb screw and lever adjustment, mirror missing, with one fixed shade. Adjustable sight vane for telescope. Fixed wooden handle. Keystone oak box, all equipment missing. M3538

107 English, c. 1800. Frame brass, radius 11⅛″. Limb brass. Scale engraved on limb graduated −2° to 137° by 1° subdivided to 20′. Reinforced brass index arm. Brass vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass adjustable with pin tool and with three fixed shades. Sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3″ long; one erecting telescope 3⅜″ long with eye piece and four pivoted shades; one plug with peep hole for sight vane; one inverting telescope 5″ long with eye piece and four pivoted shades. Plate XV M1931

Used by Nathaniel Bowditch 1795 to 1802.

108 English, c. 1810. Frame brass, radius 10⅞″. Limb brass marked "Bradford London." Scale silver graduated −5° to 139° 40′ by 1° subdivided to 20′. Reinforced brass index arm. Silver vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with tool and three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with:

one shade tube 3¼″ long; one erecting telescope 3½″ long; one inverting telescope 7½″ long with four cross hairs and an eye piece containing four revolving glass shades; a pocket for magnifier and tool, both missing. Label in box: "Samuel Emery, Water St., Salem." M1420

109 English, c. 1810. Frame bronze, radius 9¾″. Limb bronze marked "Dollond London." Scale silver graduated −2° to 140° by 1° subdivided to 10′. Reinforced bronze index arm. Silver vernier with magnifier, type B, reading to 10″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with tool, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3¼″ long; one erecting telescope 3″ long; one inverting telescope with four cross hairs 6″ long; one ruby eye piece, one plain eye piece; one spare telescope draw; one pin tool. Label in box: "Samuel Emery, Water St., Salem." M5895

110 English, c. 1810. Frame bronze, radius 9¾″. Limb bronze marked "W & S Jones, 30 Holborn London." Scale silver graduated −5° to 140° by 1° subdivided to 20′. Reinforced bronze index arm. Silver vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror with pivoted black brass shield to cover half of mirror with four fixed shades. Horizon glass adjustable with tool and three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 2⅜″ long; one erecting telescope 3½″ long; one inverting telescope 6″ long, with four pivoted screens. One screw driver, one pin tool. Compound magnifier with light reflector pivoted on arm, and an improvised shield fitting the telescope to cover the left eye. M635

111 English, c. 1810. Frame brass, radius 9½″. Limb brass marked "J & I Hardy London." Scale silver graduated −3° to 137° by 1° subdivided to 15′. Reinforced brass index arm with swinging compound magnifier. Silver vernier type B, reading to 15″.

Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin tool, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3⅛″ long; one erecting telescope 3¼″ long; one inverting telescope with two parallel hairs, 6″ long; one eye piece and one pin tool. Label in box: "F. W. Lincoln Jr & Co. 126 Commercial St Boston." M1463

112 English, c. 1820. Frame black brass, radius 7 1/16″. Limb brass marked "Spencer & Co. London." Scale silver graduated −5° to 160° by 1° subdivided to 10′. Reinforced black brass index arm with swinging compound magnifier. Silver vernier type B, reading to 10″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin tool, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box lined with blue velvet, equipped with: one shade tube 3⅛″ long; one erecting telescope 3¼″ long; one inverting telescope with four cross hairs 7¼″ long; one ruby eye piece, one screw driver. Pockets for pin tool and magnifier, both missing. Label in box: "Frederick W. Lincoln Jr. 136 Commercial St Boston." Plate XIX M2782

113 English, c. 1820. Frame double brass, radius 8⅛″. Limb brass marked "Thos Jones Liverpool." Scale silver graduated −5° to 140° by 1° subdivided to 10′. Reinforced brass index arm with swinging compound magnifier with light reflector. Silver vernier type B, reading to 10″. Tangent screw X. Adjustable index mirror with four fixed shades. Oval horizon glass adjustable with key, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3¼″ long; one erecting telescope 3⅜″ long; one inverting telescope with four cross hairs 5⅝″ long; one inverting spare draw with four cross hairs; one ruby eye piece; one magnifier in horn case; one key. Labels in box: "C. G. King N. 7 Broad St . . . Boston"; "S. Thaxter & Son . . . 125 State St . . . Boston." M2249

114 English, c. 1820. Frame double brass, radius 8⅛″. Limb brass marked "Spencer Browning & Rust London." "2267." Scale silver graduated −5° to 155° by 10° subdivided to 10′. Reinforced brass index arm with swinging compound magnifier and light reflector. Silver vernier type B, reading to 10″. Tangent screw X. Adjustable index mirror and four fixed shades. Over horizon glass adjustable with key, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3⅝″ long; one erecting telescope 3⅛″ long; one inverting telescope with four cross hairs 7″ long; one spare draw inverting with two parallel hairs 3⅛″ long; one ruby eye piece. Pockets for magnifier and key, both missing. Label in box: "S. Thaxter & Son . . . 125 State St . . . Boston." M3479

115 English, c. 1830. Frame double brass marked "1530," radius 8″. Limb brass marked "Silver" "Troughton London." Scale silver graduated −5° to 150° by 1° subdivided to 10′. Reinforced brass index arm with swinging compound magnifier and light reflector. Silver vernier type B, reading to 10″, estimation to 5″. Tangent screw X. Adjustable index mirror with four fixed shades. Oval horizon glass adjustable with pin tool and key with three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box marked "Ship Shirley" equipped with: one shade tube 5″ long; one shade tube with two parallel hairs 3½″ long; one erecting telescope 3″ long; one inverting telescope with two parallel hairs 7″ long; one ruby eye piece, one green eye piece. One magnifier in horn case; one key. Labels in box: "Gedney King, Maker, 95 State St Boston . . ."; "Thomas Tennent . . . Battery Street, San Francisco." M2384

116 English, c. 1830. Frame double brass marked "1418," radius 8″. Limb brass marked "Silver" "Troughton London." Scale silver graduated −5° to 150° by 1° subdivided to 10′. Reinforced brass index arm with swinging compound magnifier and light reflector. Silver vernier type B, reading to 10″, estimation to 5″. Tangent screw X. Adjustable index mirror with four fixed shades. Oval horizon glass adjustable with key, three fixed

shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box, brass bound, equipped with: one shade tube 5⅛″ long; one erecting telescope 3″ long; one inverting telescope with two parallel cross hairs 7″ long; one spare draw with parallel cross hairs 3¼″ long; one ruby eye piece; one green eye piece; one key. Pocket for magnifier, missing. Labels in box: "F. W. Lincoln Jr & Co. . . . 126 Commercial St Boston"; "Thomas Hemsley 11 King St. Tower Hill London Inventor of the Improved Storm & Steering Compass Manufacturers of Telescopes, Sextants, Quadrants . . . Merchants, Captains and the Trade Supplied . . ."; "Gedney King & Son 7 Broad Street Boston"; "C. G. King 7 Broad . . . Boston."

M3539

117 English, 1833. Frame double brass marked "1886," radius 8″. Limb brass marked "Palladium" "Troughton & Simms London." Scale palladium graduated −5° to 150° by 1° subdivided to 10′. Reinforced brass index arm with swinging compound magnifier with light reflector. Palladium vernier type B, reading to 10″. Tangent screw X. Adjustable index mirror with four fixed shades. Oval horizon glass adjustable with tools, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one plain shade tube 5⅛″ long; one shade tube with two parallel hairs 3½″ long; one erecting telescope 3″ long; one inverting telescope with two parallel hairs 7″ long; one black eye piece, one ruby eye piece; one key. Labels in box: Index error certificate No 1886 26 April 1833 of "Troughton & Simms 136 Fleet Street London."

Plate XVI M9820

118 English, c. 1830. Frame double brass, radius 7⅞″. Limb brass marked "Norie & Co. London." "1015." Scale silver graduated −2° to 143° by 1° subdivided to 10′. Reinforced brass index arm with swinging compound magnifier and light reflector. Silver vernier type B, reading to 10″. Tangent screw X. Adjustable index mirror with four fixed shades. Oval horizon glass adjustable with key, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle with auxiliary goose neck handle for horizontal use. Five-sided keystone mahogany box (one side

a double angle), equipped with: one shade tube 3⅝″ long; one erecting telescope 2⅞″ long; one inverting telescope with four cross hairs 7⅛″ long; one inverting spare draw with four cross hairs 2⅝″ long; one ruby eye piece; one screw driver; one key. Pockets for magnifier and pin tool, both missing. Labels in box: "J. W. Norie & Co. (Successors to the late Wm Heather) Chart & Map Seller to the Admiralty & Honble East India Compy . . . No 157 Leadenhall St. London"; "E. Brown & Son Makers 27 Fulton Slip New York." M1853

119 English, c. 1830. Frame double brass, radius 7⅞″. Limb brass marked "Troughton London." Scale silver graduated −5° to 155° by 1° subdivided to 15′. Reinforced brass index arm with swinging compound magnifier. Silver vernier type B, reading to 15″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with key (covered by removable cap), three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3″ long; one erecting telescope 3¼″ long; one inverting telescope with two cross hairs 6¼″ long; one ruby eye piece. Labels in box: "Kelvin & Wilfrid O. White Co. 112 State St Boston 38 Water St New York"; "Samuel Thaxter & Son 12 . . . Boston"; another the same; "[Badly mutilated] . . . Patronage of Admiralty East India Company Trinity House London Deviation of Compasses in Iron Vessels Found & Corrected." M6536

120 English, 1838. Frame brass, radius 7¾″. Limb brass marked "Dollond London." Scale silver graduated −3° to 143° by 1° subdivided to 10′. Reinforced brass index arm. Silver vernier type B, reading to 10″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3¼″ long; one erecting telescope 3½″ long; one inverting telescope with four cross hairs 6⅛″ long; one spare draw erecting with four cross hairs 2″ long; one green eye piece,

one pin tool. Fragment of label in box: "... 212 Front ... New York." Plate XVI M2144

Brass plate on box cover: "Presented to Captn A. Richardson by the Passengers on board the Ship Dutchess D'Orleans on her first Trip from New York to Havre Sept[r] 1838." There is a compound magnifier on screw track mounting over the vernier, with an opal glass light shield.

Captain Addison Richardson (1804-1872) was a packet and clipper master from 1835.

121 English, c. 1840. Frame brass, radius 7⅜". Limb brass marked "Geo Stebbing Portsmouth." Scale silver graduated −5° to 150° by 1° subdivided to 15′. Reinforced brass index arm with swinging arm for magnifier (missing). Silver vernier type B, reading to 15″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin and key, covered with cap, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. M3248

122 English, c. 1840. Frame brass, radius 4″. Limb brass. Scale silver marked "Troughton & Simms London," graduated −5° to 170° by 1° subdivided to 20′. Flat brass index arm with swinging magnifier. Silver vernier type B, reading to 20″. Tangent screw X. Adjustable index mirror with two fixed shades. Horizon glass adjustable with tools, two fixed shades. Adjustable sight vane for telescope. Removable wooden handle. Keystone mahogany box equipped with: one shade tube 2¾″ long; one inverting telescope with parallel cross hairs 4″ long; two ruby eye pieces; one key. M3065

Silver plate on box engraved: "Presented at the Public Examination, on the [blank] to the Gentleman Cadet [blank] by the Honble. Court of Directors of the East India Company as a mark of the Court's approbation of his attainments in Mathematics while at the Military College."

123 English, c. 1850. Frame brass, radius 6⅞". Limb brass marked "Cameron 54 South Castle St. Liverpool." Scale silver graduated −5° to 155° by 1° subdivided to 10′. Reinforced brass index arm with swinging arm for magnifier (missing). Silver vernier type B, reading to 10″. Tangent screw X. Adjustable

index mirror with four fixed shades. Horizon glass adjustable with pin and key, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box, lined with blue velvet, equipped with: one shade tube 3⅛″ long; one erecting telescope 3¼″ long; one inverting telescope with four cross hairs 7¼″ long; one inverting spare draw with two cross hairs 3″ long; one ruby eye piece; one key; one pin tool. Pocket for magnifier, missing. Plate on box top marked "Samuel Hultman." M1409

Samuel Hultman was a Salem shipmaster by 1854.

124 English, c. 1850. Frame brass 2 9/16″ diameter, radius 1 1/16″, marked "W. Harris & Co 50 Holborn, London & at Hamburg." Scale inlaid silver graduated −7° to 148° by 1° subdivided to 30′. Flat brass index arm actuated by rack and pinion. Silver vernier forms end of arm, reading to 1′. Adjustable index mirror with two shades. Horizon glass adjustable. Sight vane missing. Brass box which when screwed to base of frame forms a handle and when reversed a case for the instrument, equipped with: adjusting key only. Magnifier missing. M2082

125 English, c. 1850. Frame brass, radius 7¼″. Limb brass marked "Sibberand London." Scale silver graduated −5° to 150° by 1° subdivided to 15′. Reinforced brass index arm with swinging compound magnifier and light reflector. Silver vernier type B, reading to 15″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box, lined with yellow worsted, equipped with: one shade tube 3⅛″ long; one erecting telescope 3⅜″ long; one inverting telescope with four cross hairs 6⅜″ long; one ruby eye piece, one pin tool. Pockets for magnifier and screw driver, both missing. M2250

126 English, c. 1850. Frame brass, radius 7¼″. Limb brass marked "G. Gowland 76 South Castle St. Liverpool." Scale silver graduated −5° to 155° by 1° subdivided to 10′. Reinforced brass index arm with swinging compound magnifier. Silver vernier type

B, reading to 10″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin tool, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box, lined with green felt, equipped with: one shade tube 3¼″ long; one erecting telescope 3¼″ long; one inverting telescope with four cross hairs 7½″ long; one ruby eye piece; pin tool and magnifier, both missing.

M1430

Once owned by Dr. Livingstone, purchased at the sale in Zanzibar by Captain William Beadle of Salem.

127 English, c. 1860. Frame brass, radius 7⅝″. Limb brass marked "Parkinson & Frodsham London & Liverpool." Scale silver graduated −5° to 154° by 1° subdivided to 15′. Reinforced brass index arm with swinging compound magnifier and light reflector. Silver vernier type B, reading to 15″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin tool, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3⅛″ long; one erecting telescope 3⅛″ long; one eye piece, one pin tool. One telescope missing. M30

A spirit level 3⅝″ long, supported by two cork disks is in the box. This can be fitted to the instrument frame as a homemade effort to devise an artificial horizon.

128 English (?), c. 1860. Frame black brass, radius 6¾″. Limb brass. Scale silver graduated −5° to 155° by 1° subdivided to 10′. Reinforced black brass index arm with swinging compound magnifier. Silver vernier type B, reading to 10″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin and key, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box, lined with blue velvet, equipped with: one shade tube 3⅛″ long; one erecting telescope 3¼″ long; one inverting telescope with four cross hairs 7⅛″ long; one inverting spare draw with two cross hairs 3⅛″ long; one ruby eye piece; one key; one screw driver. Pocket for pin tool and magnifier, both

missing. Labels in box: "F. W. Lincoln & Co. 126 Commercial St Boston"; also index error certificate dated 1868, not signed. M5973

129 Scotch, c. 1860. Frame bronze, radius 7⅝″. Limb bronze marked "Alex. Dobbie Glasgow." Scale silver graduated −5° to 155° by 1° subdivided to 10′. Reinforced bronze index arm with compound magnifier pivoted on arm. Silver vernier type B, reading to 10″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin tool, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box, lined with blue velvet, equipped with: two erecting telescopes 3⅛″ long; one inverting telescope with four cross hairs 7¼″ long; one ruby eye piece; one pin tool; one magnifier in horn case. M2987

130 English, c. 1860. Frame black metal, radius 7⅝″. Limb brass marked "Cox London." Scale silver graduated −5° to 145° by 1° subdivided to 10′. Reinforced black metal index arm with swinging compound magnifier. Silver vernier type B, reading to 10″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin and screw driver, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Square oak box equipped with: one shade tube 3″ long; one erecting telescope 3⅛″ long; one inverting telescope with four cross hairs 7¼″ long. Pocket for eye piece, missing. Label in box: "Lilley & Reynolds Ltd. 10 London St., Fenchurch Street, London E. C. 3 Telephone Royal 3759/3295." M8713

131 English, c. 1860. Frame bronze, radius 7½″. Limb brass marked "S. W. Silver & Co Cornhill, London." Scale ivory graduated −5° to 124° by 1° subdivided to 20′. Flat bronze index arm, marked "L. R. James." Ivory vernier type B, reading to 1′. Tangent screw X. Index mirror missing, with three fixed shades. Horizon glass fixed. Sight vane for telescope with double peep with pivoted ruby shade. No handle. Keystone mahogany box, no equipment. M11045

132 English, c. 1860. Frame blackened brass, radius 7½″. Limb brass marked "Hughes London." Scale silver graduated −5° to 149° by 1° subdivided to 10′. Reinforced black brass index arm with swinging compound magnifier and light reflector. Silver vernier type B, reading to 10″. Tangent screw X. Adjustable index mirror with four fixed shades. Semi-oval horizon glass adjustable with pin tool, three fixed shades. Sight vane for telescope. Fixed wooden handle. Keystone mahogany brass bound box equipped with: one shade tube 3¼″ long; one inverting telescope 6″ long; one inverting telescope with four cross hairs 6″ long; one spare draw inverting with four cross hairs 1¾″ long; one ruby eye piece; one pin tool. Pockets for screw driver and magnifier, both missing. M44

133 English, c. 1860. Frame bronze, radius 7½″. Limb bronze marked "Poulby, 126 Wapping London." Scale silver graduated −5° to 150° by 1° subdivided to 10′. Reinforced bronze index arm with swinging compound magnifier and light reflector. Silver vernier type B, reading to 10″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin tool and wrench, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3¼″ long; one telescope missing; one inverting telescope with four cross hairs 7″ long; one dark glass shade; one adjusting thumb wrench. Label in box: "Frodsham and Keen Chronometer, Watch & Nautical Instrument Makers, 9 St George's Crescent, Liverpool." M11129

134 English, c. 1860. Frame brass, radius 7⅜″. Limb brass. Scale ivory graduated −5° to 119° by 1° subdivided to 20′. Reinforced brass index arm with swinging magnifier, missing. Ivory vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass in fixed frame, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Keystone mahogany box: no equipment. Label in box: "J. Hughes, Manufacturer of Sextants & Quad-

rants Compasses, Telescopes &c. 38 Queen Str, Ratcliffe E London. N.B. The above Articles clean'd & repaird in the best manner." Fragments, indecipherable, of other labels.

M11048

135 English, c. 1870. Frame brass, radius 7¼″. Limb brass, lower edge beveled. Scale silver, on bevel of limb, graduated −4° 40′ to 139° 40′ by 1° subdivided to 20′. Flat brass index arm with post for swinging magnifier which is missing. Silver vernier type B on beveled end of arm, reading to 30″. Tangent screw Z. Adjustable index mirror with three fixed shades. Horizon glass adjustable with pin, three fixed shades. Adjustable sight vane for telescope (damaged). Fixed wooden handle. No box.

M2244

136 English, c. 1895. Frame bronze, radius 7⅜″. Limb brass marked "C. Cummins, 118 Leadenhall St London." Scale silver graduated −5° to 145° by 1° subdivided to 10′. Reinforced bronze index arm with pivoted magnifier marked "R. P. Cochran R.N." Silver vernier type B, reading to 10″. Tangent screw X. Adjustable index mirror with four shades. Horizon glass fixed, three shades. Sight vane for telescope. Fixed wooden handle. Keystone mahogany box equipped with: one shade tube 3¼″ long; one erecting telescope 3¼″ long; one inverting telescope with four cross hairs 7¼″ long; one draw inverting with parallel hairs 3¼″ long; two black eye pieces; one pin tool. Inlaid wooden shield on top of box engraved "R. P. Cochran R.N." Certificate of Devonport Observatory "sextant 7757 index error" dated Feb. 1897 signed "J. Coombes, Admiralty Agent." Plate XVI M11046

137 American, c. 1900. Frame black brass, radius 7⅝″. Limb brass marked "C. C. Hutchinson Boston." Scale silver graduated −5° to 120° by 1° subdivided to 20′. Reinforced black brass index arm with swinging compound magnifier. Silver vernier type B, reading to 30″. Tangent screw X. Adjustable index mirror with three fixed shades. Horizon glass adjustable with pin tool, three fixed shades. Sight vane for telescope. Fixed wooden handle.

Square mahogany box equipped with: one shade tube 3⅛″ long; one erecting telescope 4¼″ long; one eye piece, ruby; one pin tool. Label in box: "Chas C. Hutchinson 126 Commercial St Boston." M3536

138 American, 1911. Frame black metal, radius 7⅛″. Limb brass. Scale silver graduated −5° to 145° by 1° subdivided to 10′. Flat black metal index arm with swinging magnifier marked "Keuffel & Esser Co New York 22873." Silver vernier type B, reading to 10″. Tangent screw Y and stop on limb but linked to arm. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin and key, three fixed shades. Adjustable sight vane for telescope. Fixed wooden handle. Square mahogany box, number plate 22873, equipped with: one shade tube 3⅝″ long; one inverting shade tube with two parallel hairs, 4″ long; one erecting telescope 2¾″ long; one inverting telescope with two parallel hairs, 6¼″ long; one pin tool, two eye pieces, green and ruby; two spare mirrors; two screw drivers; one key. M2525

139 English, 1922. Frame blackened brass, radius 7″. Limb brass marked "Heath & Co Ltd New Eltham London." "T 865." Scale silver graduated −5° to 155° by 1° subdivided to 10′. Reinforced black brass index arm with swinging magnifier. Silver vernier type B, reading to 1″. Tangent screw X. Adjustable index mirror with four fixed shades. Horizon glass in fixed frame, three fixed shades. Sight vane for telescope. Fixed wooden handle. Square wooden box equipped with: one monocular 1¼″ objective x 2¾″ long; one shade tube 3¼″ long; one inverting telescope with cross hairs 7″ long; two eye pieces, green and gray; one screw driver; one pin. Label in box: Certificate of examination from Hezzanith Observatory Works dated 12 July 1922. Plate XVII M11047

140 German, 1931. Frame metal, radius 7⅜″. Limb metal. Scale silver marked "Made in Germany 12793" graduated −5° to 137° by 1°. Metal index arm marked "C. Plath Hamburg."

"Kelvin & Wilfrid O. White Co." "Boston – New York." Drum micrometer vernier, reading to 30″. Adjustable index mirror with four shades. Horizon glass $2\frac{5}{16}$″ diameter, three shades. Adjustable sight vane for telescope. Wooden handle. Square mahogany box with sailor-made duck cover equipped with: one shade tube with black eye piece $3\frac{1}{2}$″ long; one monocular $1\frac{1}{4}$″ objective, 3″ long erecting; one monocular $1\frac{3}{4}$″ objective, $4\frac{1}{4}$″ long; one lens brush; one adjusting wrench; one eye piece. Labels in box: In German and English, Certificate of Examination dated 28 Nov. 1930 signed by "Deutsche Seewarte;" metal plate marked "C. Plath Hamburg Stubbenhuk 25." Plate XVII M11063

141 English, 1945. Frame black metal, radius $6\frac{1}{8}$″. Limb brass marked "H. Hughes & Son Ltd London." "Mate Serial No. 48611." "Made in Great Britain." Scale silver graduated –5° to 125° by 1°. Flat black metal index arm marked "Husun." Vernier; plastic micrometer drum, electrically lighted, reading to 10″. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin, three fixed shades. Adjustable sight vane for telescope. Rubber handle, enclosing dry cell for micrometer light. Square mahogany box, lined with green baize, equipped with: one monocular $1\frac{1}{4}$″ objective x $2\frac{3}{4}$″ long; one eye piece, green; one pin tool; one bottle oil. Label in box: Correction Certificate of maker dated 28 June 1945.
Plate XVII M7389

142 American, 1945. Name plate marked "Ansco Serial No. AF45-12546." U. S. Air Force Bubble Sextant; too complex for adequate description. Square box. M6169

G. Half Circles

143 English, c.1800. Arc-shaped frame $12\frac{1}{16}$″ radius, made of ebony, each side face of the arc is covered with brass, the upper side graduated from –4° through 0° to 197° by 20′, the 0° point also marked "S." A brass index arm with a 1′ vernier type B and

tangent screw type X. Marked "J & W Watkins, Charing Cross, London." Parts missing. See also M474, four leg dividers.

Plate XX M473

144 German, c. 1910. Frame black metal, radius 6⅛". Brass limb with silver scale graduated −3° to 187° by 1° subdivided to 20'. Flat black metal index arm marked "Carl Bamberg No 11842 Friedenau Berlin." Silver vernier type B reading to 30". Tangent screw Y. Adjustable index mirror with four shades. Sight vane for telescope. Adjustable horizon prism with three shades. Fixed hard rubber handle. Square mahogany box equipped with: one erecting telescope 2⅝" long 1¾" objective lens; one inverting telescope 9" long 1¼" objective lens with four cross hairs; one inverting draw with four cross hairs; one screw driver; one metal glare shade; one sable lens brush.

Plate XXI M5533

This superb instrument is called the "Gadow" design in Bamberg's 1910 Catalog.

145 American, c. 1920. Frame black metal, radius 5½". Bronze limb with silver scale marked "6067," graduated −5° to 185° by 1° subdivided to 10'. Flat black metal index arm with swinging magnifier marked "Brandis & Sons, Brooklyn, N. Y." Silver vernier type B reading to 10". Tangent screw Y. Adjustable index mirror with four fixed shades. Horizon glass adjustable with pin and screw driver, three fixed shades. Sight vane for telescope. Fixed wooden handle. Square mahogany box marked "A. S." equipped with: one erecting telescope 4¼" long; one shade tube 4¼" long; one blue eye piece; one pin tool; one screw driver. Label in box: "Kelvin & Wilfrid O White Co. 112 State Street, Boston. 38 Water Street, New York, 111 Commissioners Street, Montreal." M8274

Box stamped "Arthur Small Palmer Island Light Station, New Bedford Harbor, Mass."

H. Circles

146 French (?), c. 1795. Designed by Chevalier De Borda. Brass circle 11″ diameter divided by degrees from 0° to 720° subdivided to 30′. Inner ring divided 0° to 120° and 0° to 120° both by degrees, stops missing. Movable index arm with type X tangent screw and type B vernier reading to 1′. Horizon arm with type X tangent screw and type B vernier reading to 1′. Telescope with two vertical hairs, adjustable in one plane only. Mahogany box with engraved label: "Gedney King . . . Maker 29 State Street Boston." Box contains three colored shades for horizon mirror and three for index mirror, and handle.

Plate XXII M4082

Once owned by Nathaniel Bowditch. An engraving of the instrument was used by Bowditch to illustrate *The New American Practical Navigator*, 2nd Edition, Newburyport, 1807.

147 English, c. 1796. Brass frame, 11″ diameter, marked "Troughton 11 London," gold scale graduated 720° by degrees subdivided to 20′, numbered 160° to 0° to 160°. Three index arms 120° apart, each with a type B gold vernier reading to 1′, one with double type X tangent screw. Attached to the rear of the frame is a brass arm carrying the horizon mirror with three colored shades, the telescope mount and three colored shades, and the index mirror. Handles for right and left hand observations. Accompanied by a brass columnar stand, three legs with leveling screws, and a counterweight for horizontal use.

Plate XXII M803

148 English, c. 1800. Brass circle 10¼″ diameter, marked "Fayrer London" with inlaid silver scale graduated 720° by degrees subdivided by 20′, numbered from 130° to 0° to 130°. An inner concentric brass circle 9$\frac{9}{16}$″ diameter has a type B vernier reading to 1′, and a type X tangent screw. Five other verniers numbered 2 through 6, reading to 1′, are spaced around the inner circle 60° apart. The frame of the outer circle carries the telescope holder and the horizon mirror, equipped with three glass shades. The index mirror is attached to the inner circle with its

three glass shades carried on the outer circle frame. A magnifier is pivoted on an arm moving over each vernier. There are two handles arranged on opposite sides for right and left hand use. In a mahogany box equipped with: five telescopes; three shaded eyepieces; magnifying glass; boxwood head rest; and a small magnifying prism in a boxwood frame. Label in box: "J. Fayrer Mathematical Instrument Maker 40 White Lion Pentonville London." M4530

149 English, c.1850. Brass circle 10⅜″ diameter, unmarked, silver scale graduated and numbered 720° by degrees subdivided by 20′. Brass arm carrying horizon mirror and adjustable telescope mount, stop and type Y tangent screw on sight and type B vernier reading to 1′; on horizon end, pivoted index mirror, stop and unusual type Y tangent screw, type B vernier reading to 1′ and magnifier. Inner semi-circle with stops, graduated by degrees 0° to 180° and 0° to 130°. In mahogany box equipped with: four colored glass shades for the index mirror; four for the horizon mirror; one vent; two telescopes; two eye pieces; two adjustment try-squares and a wrench; one handle; and space for spare horizon mirrors. Labels in box: "Frederick W. Lincoln Jr. Mathematical Instrument Maker, Nautical Stationer No 136 Commercial St Boston"; "William DeSilva 38 Regent Road opposite the Bramley-Moore Dk. Gate, Liverpool." M2397

150 French, c. 1864. Brass circle 10½″ diameter, marked "E. Lorieux à Paris (308)" and "Schiavelli Bellani à Brest," inlaid silver scale graduated 0° to 720° by degrees subdivided to 20′; inner semi-circle brass silver plated, with two movable stops, divided from 0° to 140° and from 0° to 150° by degrees. Movable index arm with type Y tangent screw, type B silver vernier reading to 1′. Horizon arm has type B vernier reading to 1′ with type Y tangent screw at sight end. All mirrors and telescope fully adjustable. Index arm is inscribed "Donné par l'Empereur [Napoleon III] À Mr. Pillot Sorti de l'Ecole Navale Imperial avec le 2e." Mahogany box equipped with: spare telescope with grid lines; spare plain telescope; spare draw; three

eye pieces, square for adjusting the mirrors; three shades for the index mirror; eight shades and a slit for the horizon mirror; spare mirrors; cleaning cloths; adjusting wrench and handle. Label in box: "E. Lorieux Four du Dépôt des Cartes & Plans de la Marine Imperiale. 30 Rue et Passage Dauphine et rue Mazarine 27 Paris." M3064

Joseph Pillot, born at Mans 1846, entered the Naval School in 1862, graduated in 1864 and died at Saigon in 1897 while in command of the *Isly*. He distinguished himself as a hydrographer and nautical astronomer.

I. Artificial Horizons

151 Mahogany box 6⅜″ x 6⅜″ x 2¼″ with black glass mirror top and three leveling screws. Pine case, rosewood grained, 9½″ x 7½″ x 3¾″. Unmarked. Plate XXIII M4016

152 Alabaster cylinder 4⅛″ diameter, 1¾″ high. A glass covered dish-like depression in the upper surface. A reservoir for mercury is in base. When the cylinder is placed on deck the mercury ascends into the dish. Brass bail handle. Alabaster cover. Mahogany case 5⅛″ x 5⅛″ x 3⅜″ high. Unmarked.
Plate XXIII M748

153 Teak wood trough, blackened brass cover with glass pane, 6⅜″ x 3½″ x 4¼″ high, glass mercury bottle; enclosed in mahogany case 9½″ x 4¼″ x 4¾″ high, with engraved label "Gedney King Mathematical Instrument maker no 7 Broad Street near State St. N.B. Orders thankfully received and punctually executed."
Plate XXIII M747

154 Lignum Vitae trough 2¾″ x 4⅞″ x ⅞″ with ivory filling and emptying valves enclosed in a black metal pan. Blackened brass cover with glass panes, 6¼″ x 3⅜″ x 4¼″ high. To prevent the loss of mercury by spilling, the boxwood mercury flask with boxwood filling and emptying funnel is fastened in the mahogany case 7¼″ x 5¾″ x 5″ high, which also holds the trough and cover. Plate XXIII M798

155 Mahogany trough 4⅜″ x 2¼″ x ½″, blackened brass cover with glass panes, 5″ x 2½″ x 3 1/16″ high. Boxwood mercury flask with boxwood funnel. Enclosed in unmarked mahogany case 3⅞″ x 7⅜″ x 3¾″ with homespun linen cover, cross-stitched initials "W[illiam] O[sgood]." M2718

William Osgood (1785-1834) was a Salem shipmaster by 1815.

II. Instruments of Direction

Once out of sight of land, the sailor is lost unless he has some means of determining direction. The sun or stars will serve in clear weather but not in fog or storm. Who invented the *compass*, and when, is not known, possibly the Chinese, at least it has long been attributed to them. Seemingly the compass first appeared in Italy about A.D. 1100 and may have come to Europe with the return of religious pilgrims from the Near East to which it might have been brought over the Silk Road from China. The first compass was probably a small piece of lodestone floating on a bit of wood in a bowl of water. Perhaps then a quill or hollow stick packed with powdered lodestone was floated in the water container. Next came an iron needle magnetized by touching it to a lodestone. There is some evidence for each step, but when and where and exactly what took place is uncertain. By the early sixteenth century the compass substantially as we know it today was in use. Since then there have been only minor improvements, until the practical liquid compass was invented by Ritchie in Boston about 1863. The compass card has changed even less, and is far older than the compass itself. It originated in the diagram of the names of the eight winds in honor of which the Ancient Greeks had erected an octagonal temple on the Acropolis as early as the first century before Christ. By tradition the fleur-de-lys at the North point came from the direction of France (the national emblem of France is the fleur-de-lys) from Italy; the decorated East point marked with a cross, later with all sorts of devices, usually pagan, is derived from the direction of the Holy Land, again from Italy. In 1932 the lettering of the compass points N, E, S, and W was standardized throughout the world to eliminate the confusion caused by different languages.

The *tell-tale compass* with its card visible from below, usually hung over the skipper's bed or chart table so that he might see at any time how the ship headed. Of course these had reversed East and West points on their cards. Other tell-tales were double-faced and, hung under a skylight, would show how the helmsman was doing both above to the watch officer and below to the skipper.

Still other kinds of compasses had specific uses, such as the *azimuth compass* for taking bearings, or the *surveyor's compass* for making charts, or the very delicate trough needles used to determine changes in magnetic variation.

A. Lodestones

156 English, seventeenth century. Oval cylinder 2⅛″ x 1⅜″ x 2½″ high. Weight 1 lb. 4 oz. Brass caps on top and bottom, top with brass suspension ears, ends of bottom marked "North Pool" and "S." Iron bars at each pole extend through both caps. Keeper and handle are modern replacements.

Plate XXVI M10327

B. Compasses

1. *Mariner's*

157 American, before 1775. Turned pine bowl 6⅞″ diameter, 3½″ deep, glazed top. Engraved 32 point dry card, fleur-de-lys North, decorated East. Divided quadrantly by degrees, marked "Made & sold by Benjn. King Salem, New-England," crown in center, brass bearing. Strap copper gimbal rings in oak box 9¾″ x 9¾″ x 6⅛″, pine sliding lid, marked in ink by a former owner "R. Procter Jr." and roughly carved "1720." Needle system cannot be determined. Plate XXIV M28

158 English, c. 1790. Brass kettle drum-shaped bowl, glazed top, 2⅛″ diameter, lead weight in bottom. Engraved 32 point dry card, divided quadrantly by 10°, fleur-de-lys North. Flat needle, brass bearing. Mounted in cast brass gimbal rings in brass drum-shaped case 2¾″ diameter by 1⅝″ deep, screw cover. In the bottom of the case is pasted an engraved label "Made by Jams. Chapman in St. Catharines London." M8754

159 English, c. 1800. Brass drum-shaped case, glazed top 2″ diameter, brass cap. Engraved 32 point dry card, fleur-de-lys

North, decorated East, divided quadrantly by 2°, marked "Spencer & Co N° 66 Wapping." Flat needle, brass bearing. M2616

160 American, c.1800. Turned pine bowl, glazed top, 7¼″ diameter, 3¾″ deep. Engraved 32 point dry card, fleur-de-lys North marked "Callender Sc." Indian at East, center marked "Made by Gedney King, Fore-Street near the foot of Cross Street Boston" enclosed in a laurel wreath. Pasted over is another engraved label marked "B. King Maker Salem." Divided quadrantly by degrees, brass bearing. This card is similar to but not identical with that in M849. Needles, two wires bent into diamond shape, held to card by a cutting from the *Essex Gazette*, issue unknown. Suspended in strap brass gimbal rings in an oak box 10¼″ x 10¼″ x 6⅛″, sliding pine top. M27

161 American, c. 1802. Turned, unpainted oak bowl 7⅜″ diameter, 4⅜″ deep, glazed top. Engraved 32 point dry card fleur-de-lys North marked "Callender Sc." East decorated with American Indian, bow in right hand, arrow in left, star over right shoulder (Seal of Commonwealth of Massachusetts) divided quadrantly by degrees, circular engraved label "B. King. Maker. Salem," pasted in center. Under it the card itself is engraved "G. King Maker, Fore Street, Boston." Plain brass bearing. Needles, two wires bent to diamond shape, held to underside of card by cut scrap of *Salem Gazette* no. 1069 (20 November 1801). Double strap copper gimbal rings in oak box 10⅜″ x 10⅜″ x 6½″. This compass and box have been sectioned to show construction. Plate XXIV M849

162 English, c. 1815. Turned wooden bowl glazed top 7¼″ diameter, lead weight in bottom. Engraved 32 point dry card, fleur-de-lys North, decorated East. Divided quadrantly by degrees. Label of "Robert Merrill 149 Maiden Lane New York" pasted over: illegible label; fragment of an unidentified label; the original card marked "Jones & Rust Old Dock Liverpool," in the center of which appears a masonic square and compass. Needle flat with brass bearing; underside of card marked in ink "June

1831" and in pencil "Repaired in shape J. L. Miller Aug 18 1859." In strap brass gimbal rings mounted in oak box 10¼" x 10¼" x 5¾". No top. Lubbers line in the bowl is a strip of sheet brass inlaid edgewise vertically. M9149

163 American, c. 1840. Brass drum-shaped bowl, lead weight in bottom, glazed top, 6⅜" diameter. Printed 64 point dry card, fleur-de-lys North, slightly decorated East, marked "Robert Merrill New York." Needle, pointed end flat with circular center around a very small quartz bearing set in brass. Cast brass gimbal ring mounted in a flat top binnacle box 9½" deep x 17½" wide x 17¼" high, wooden lashing cleats on ends. In a separate compartment is a brass kerosene lamp. The front has a glazed section before the compass, and a solid door on the lamp side. M5534

164 American, c. 1840. Brass spun kettle drum-shaped bowl, glazed top 9½" diameter. Wood cut 128 point dry card, fleur-de-lys North. Original label "Robert Merrill New York," on which is pasted first, label of "John Kehew New Bedford" and second, label of "C. R. Sherman & Co. New Bedford." Needle flat, pointed ends, circular center around brass bearing cup, quartz bearing. Cast brass gimbals in pine box 13¼" x 13¼" x 8¼". Sliding pine lid. M3245

165 American, c. 1840. Spun brass kettle drum-shaped bowl, glazed top 7⅛" diameter. Engraved 32 point dry card, fleur-de-lys North, decorated East. Label "Frederick W. Lincoln Jr. 126 Commercial St. Boston" pasted over maker's [Blunt's] label, of which only "179 Water Street C . . . Burling Slip" [New York City] can be read. Divided by degrees quadrantly in two concentric scales. Needle, flat lozenge shape, brass cup with quartz bearing. Cast brass gimbals in mahogany stained box 10" x 10" x 6½". The sliding lid is missing. M3734

166 American, c. 1850. Spun brass kettle drum-shaped bowl, glazed top 7⅛" diameter. Engraved 32 point dry card, fleur-de-lys North marked "Callender Sp." decorated East, divided by de-

grees quadrantly marked "S. Emery Salem." Brass bearing. Needle flat, square ended lozenge shape. Cast brass gimbal ring in pine box 10″ x 10″ x 7″, sliding top. In the bowl written in pencil is "June 15, 1859 Jany 19, 1860." M519

167 English, c. 1850. Spun brass bowl 6¼″ diameter, 3¾″ deep, glazed top, lead weight in bottom around the pivot. Engraved 128 point dry card, fleur-de-lys North, marked "Spencer, Browning & Co. Minories London." Mica stiffener, brass bearing, single flat needle. Single cast brass gimbal ring mounted in oak box 8½″ x 8¾″ x 5½″, pine sliding top. M2492

168 American, c. 1860. Spun brass kettle drum-shaped bowl, lead weight in bottom. 32 point dry card, fleur-de-lys North, marked "E. & G. W. Blunt, New York," 7″ diameter, pasted to mica disc, with plain paper pasted below mica, the whole screwed to a rectangular brass frame, the East and West sides each carry a set-on-edge flat needle 6⅛″ long, 1″ deep, in center a circular brass frame is screwed to the card with a transverse rack supporting an inverted, adjustable brass pin. The stalk is a brass lyre-shaped bracket carrying a small gimbal ring in which is mounted a counter-weighted brass cup for the pivot pin. The top of the cup is removable. Under it is a quartz bearing mounted in a brass rim supported in the cup on a coil steel wire spring. A cast brass gimbal ring supports the bowl in a mahogany box 11″ x 11″ x 7¾″. Sliding lid missing. M9279

169 American, c. 1860. 32 point dry card, fleur-de-lys North, marked "F. W. Lincoln Jr. & Co. Boston." Quartz bearing enclosed in brass. Wooden bowl 7″ diameter, 4¼″ deep, painted green, interior white, suspended in double sheet copper gimbal rings in pine box 10″ x 10″ x 7″. Needle not visible. M9340

170 American, c. 1860. Spun brass kettle drum-shaped bowl, glazed top 7¼″ diameter, lead weight in bottom. Printed 128 point dry card, fleur-de-lys North, pasted in center is label of "F. W. Lincoln Jr. & Co. Boston, Mass." Brass cup with quartz bearing. Cast brass gimbal ring suspended in a mahogany slant top,

bracket footed, binnacle box 9½″ wide x 10″ long x 11¾″ overall height, fitted with a brass kerosene lamp and lashing eye at each end. Oval glazed opening in the slant top. Needle flat with pointed ends. Plate XXV M2459

171 American, c. 1865. Spun brass kettle drum-shaped bowl 7⅝″ diameter, glazed top, lead weight in bottom. Printed 64 point dry card, fleur-de-lys North, decorated East marked with pasted sticker "C. R. Sherman & Co, New Bedford." Complicated double gimbal attached to card carries a pivot pin which rests in a brass cup on the top of the stalk. Bowl attached to a cast brass gimbal ring suspended in a mahogany box 10⅞″ x 10⅞″ x 5¾″. Box has a printed label "Repaired at C. R. Sherman's Navigation Store, 49 North Water cor. of William St., New Bedford, Mass. Handle with great care," on which has been written in ink "Bark *Progress*." Needle, flat 6½″ x ⅝″ with 2″ open circle at mid-length around the pivot pin. Plate XXV M862

172 French, c. 1870. Brass drum-shaped case, glazed top 4½″ diameter. Engraved 32 point dry card, marked "Mansini Opticien au Havre," fleur-de-lys North, decorated East. Needle flat with brass cup and quartz bearing. M2145

173 Liquid, American, c. 1900. Cast brass bowl stamped "E. S. Ritchie & Sons Boston 72085," 3¾″ diameter. 128 point, 360° card, marked "Ritchie Boston." Fleur-de-lys North. Magnets concealed. No gimbals: a weighted base screwed in a mahogany box, 7½″ x 7¼″ x 5″, including the cover. M11060

174 Liquid, American, c. 1900. Cast brass bowl, stamped "Ritchie Boston 78004," 5¼″ diameter. 128 point, 360° card, marked "Ritchie Boston." Fleur-de-lys North. Six parallel magnets. Mounted in double gimbals. Mahogany box 9⅝″ x 9⅝″ x 4″, cover missing. M11061

175 Liquid, American, c. 1920. Die cast bowl, glazed top 5⅛″ diameter. Printed card 8 points, star at North, divided by 5° from

0° at North to 35 [350], marked "Star Boston," bowl stamped "13001." Knife edge gimbals set in a copper binnacle box 8¾" high x 6¾" wide x 7" deep with carrying handle and mounting bracket. Glazed slope top. On the right is a brass kerosene lamp. On the left is a copper box for dry cells with a small electric light mounted in the top. A name plate on the front reads "Kelvin & Wilfrid O. White Boston." M3703

176 Liquid, American, c. 1920. Cast brass bowl, stamped "E. S. Ritchie & Sons Inc. Boston. 109066," 9¼" diameter. 128 point, 360° card, fleur-de-lys North marked "Ritchie Boston," six parallel magnets. Bearing marked "Ritchie Pembroke Mass. Made in U.S.A." Single gimbal ring, knife edge bearings, in wooden box 12" x 12" x 5", cover missing.

Plate XXVI M11062

177 Liquid, American, c. 1940. Die cast bowl, glazed top 3⅜" diameter. Printed card 64 points, decorated North, divided by degrees 0° to 360°. Marked "Trade Dirigo Mark Seattle, Wash. U.S.A." Mounted in wooden box 5¾" x 5¾" x 3". M9984

178 Liquid, American, c. 1944. Cast brass bowl, 10¾" diameter at top. 7¼" card, 128 points, 360°, four lubber lines at quadrants. Marked "Kelvin & Wilfrid O. White Co. Boston & New York, U.S.A." Six parallel magnets. One gimbal. From binnacle of U.S.S. *Huntington* (CL-105). M11052

2. *Oriental Mariner's*

179 Japanese compass maker's shop sign. Oak disc 11⅞" diameter, 1" thick. In the center is a glazed 3½" diameter hole lined with brass, the bottom engraved with the constellation Big Dipper, the upper edge engraved with twelve direction characters. Bare needle, 2⅜" long, half moon at South-seeking end. The surface of the disc has four characters incised at the cardinal points; outside of them twelve characters of direction; and outside of these twenty-eight characters of constellations.

Plate XXVII M2069 & E16437

180 Chinese, c. 1800. Turned wooden cylinder 3½″ diameter, 1$\frac{5}{16}$″ thick, painted red. Wooden cover ¾″ thick. The upper surface painted black, with twenty-four divisions, twenty characters painted white and four painted red. A brass wire lubbers line over a 1¾″ diameter hole, interior painted white. Bare South-seeking needle, 1⅝″ long, arrow point at South, feathers at North. A separate circular glass cover bound with brass is provided. Given to the East India Marine Society in 1801.

Plate XXVII E8781

181 Chinese. Turned wooden cylinder 3¾″ diameter, 1⅞″ thick. Wooden cover ⅞″ thick. Upper surface painted black with twenty-four divisions and incised characters, one painted red, three yellow, twenty white. A brass wire lubbers line over a 2″ diameter concavity in the center, painted white, with a South-seeking needle 1⅝″ long, arrow point at South, feathers at North, brass bearing, glazed top. Plate XXVII E8782

182 Korean, c. 1880. Turned wooden cylinder 2$\frac{11}{16}$″ diameter, 1″ thick. Wooden cover ½″ thick. Upper surface painted black with four incised characters, the cardinal points, filled with white paint, and around the outer edge twenty-four incised characters. In the center is an $\frac{11}{16}$″ diameter hole lined with white paper. The pivot carries a damaged bare needle, the South-seeking end cruciform. Brass bearing. Plate XXVII E1473

183 Japanese, 1900. Turned hardwood cylinder 2⅜″ diameter, ¾″ high, with wooden cover ½″ high. The upper surface is painted black with twelve divisions, each with an incised character of direction, one painted red, the remainder white. In the center is a glazed 1¼″ diameter hole, painted silver with four black characters at the cardinal points, a pin in the center carries a bare needle 1″ long with a cross bar on the South-seeking end, brass cup bearing. On the bottom is the inscription in ink in Japanese "Bought in May 1900 by Nose Shigazo."

Plate XXVII E12599

3. *Sun*

184 American, 1945. Marean-Kielhorn Director, Lifeboat Model. This complicated instrument defies brief description. Its purpose is the determination of true direction by the sun. Made by "Air Instruments, Inc., Boston, Mass." Complete with directions and wooden carrying case. M8989

4. *Tell-tale*

185 Danish, c. 1760. Turned crown-shaped wooden bowl, with bas-relief carved floral swags, gilded rims and decorations, background painted black, top diameter 6¼″, bottom diameter 7″, depth 3¼″. Top and bottom glazed. Single gilded strap brass gimbal ring and suspension bracket. Double engraved card, top 32 point, fleur-de-lys North, decorated East, cardinal and semi-cardinal points lettered in Danish. Circular engraved label "James Gale, Salem," pasted in center over the card which is marked "I. I. Borger, KIØBENHAVN." Lower card 32 point, fleur-de-lys North, decorated East reversed; circular label "Gray and Lissett, makers, Liverpool," pasted in center over card marked "B* BROWNE Mathl Instt maker & c Bristol." Needle, flat bar with brass bearing.
Plate XXVIII M25

186 English, c. 1790. Brass drum case, 5¾″ diameter, 4¼″ deep, glazed bottom. Engraved 32 point card, fleur-de-lys North, decorated East reversed, marked "Made by Jno Gilbert Tower Hill, London." Plate XXIX M634

187 American, c.1840. Brass drum case, glazed bottom 6⅜″ diameter, 4″ deep. Printed paper card 64 points marked "Robert Merrill, New-York," fleur-de-lys North, East-West reversed. M2982

188 American, c. 1847. Brass drum case glazed top diameter 7″, glazed bottom 8″, 4¼″ deep. Case inscribed "Presented to John Wilson by the Orion Boat Club July 1847," and also "Presented to Wm. E. Sherriffs by John Wilson July 1885." Engraved

translucent paper card marked "C. G. King Boston," 32 point, fleur-de-lys North, fancy trefoil East, mounted on mica; flat lozenge-shaped needle, double brass bearing cup with quartz for lower bearing. Mounting bracket missing. M6548

189 English, c. 1850. Brass drum case 5¾″ diameter, 3½″ deep, glazed bottom. Engraved 32 point card, fleur-de-lys North, East reversed, marked "Cameron, Liverpool." On a ribbon under the fleur-de-lys is engraved "South castle Cameron Liverpool." M8949

190 American, c. 1870. Brass drum case, glazed bottom diameter 5″ x 3¼″ deep. Engraved paper card marked "T. S. Negus & Co New-York," 32 point fleur-de-lys North, East-West reversed. In order to make a proper tell-tale card, the easterly and westerly points have been carefully cut from a mariner's compass card and pasted on the stiffener in reverse. Divided quadrantly by degrees, brass bearing mounted in gimbal ring and bracket. Needle, flat lozenge-shaped bar, with quartz bearing in a brass cup. M2753

5. *Azimuth*

191 English, c. 1793. Brass drum-shaped bowl, adjustable lead counterweight on bottom, glazed top 7⅜″ diameter, mounted in cast brass gimbal ring suspended in a swivel bracket in a mahogany box 13½″ x 13½″ x 9¼″ over-all. Over the compass bowl is mounted on a graduated 180° arc a universal ring dial engraved "Invented and Made by R. Walker London." On top of the ring is an alidade with slit and vertical hair sights. The slit sight has a running ruby glass eye shade. Engraved 32 point dry card, fleur-de-lys North marked "Callender Sp," decorated East. Marked in center "S. Emery Salem," divided by degrees quadrantly. Over the card is a silvered scale divided quadrantly by 30″. Needle, carefully made and polished, vertical flat bar swelled at center around a brass cup with jewelled bearing. Card stop fitted to the case. Plate XXX M2904

192 Russian, 1809. Drum-shaped brazed copper bowl, lead weighted, glazed top 7¼″ diameter, mounted in cast brass gimbal ring in a brass bracket which swivels in a carefully made box 12¼″ x 12½″ x 6⅛″. Gimbal ring has "N° 16″ engraved on one side and an anchor with the figures "1818" opposite. The rim of the top has brass fittings for the alidade (brass) with a slit sight at one end and a vertical cross hair sight at the other. Engraved 128 point dry card, a foul anchor decorates North, the cardinals and semi-cardinals are lettered "ON," "O," "OS," "S," "SW," "W," and "NW." The edge is divided quadrantly by degrees with an identical silvered brass rim scale attached to the card. The center is marked in Cyrillic letters "St. Petersburg 1809." A lubber's line is engraved on a card stop. Brass cup with a quartz bearing. Bowl punched in three places with an anchor without stock. Brass stalk with steel point. Needle is a flat bar, with square ends, and swell center. M9278

193 American, c. 1823. Drum-shaped copper bowl with lead counterweight, glazed top 7″ diameter. Engraved 32 point dry card with label "John H. Wheeler New-York," pasted over the label of the same "John H. Wheeler New York," divided by degrees quadrantly. Needle, flat bar swelled center around brass cup with quartz bearing. Pasted to underside of mica stiffener is a fragment of a New York newspaper issue unknown, but with a date 1820 showing. Mounted in cast brass gimbal ring in a painted box 10¼″ x 10¼″ x 5½″. A brass alidade fits on the rim of the top, one sight with a cross hair, the other a vertical slit. M2251

6. *Pelorus*

194 English, c. 1910. Mahogany box 10½″ x 10½″ x 13¾″ high, containing an inclinometer reading to 30° port and starboard and a gimbal mounted brass dial 7¾″ diameter marked "London Polaris Frank Morrison, Cleveland, O. Patent No. 2559." The dial is divided by degrees from 0° to 180° to 0°, again by degrees quadrantly and again by 128 points. Mounted above it on a standard is a dial 5″ diameter, divided by degrees 0° to 180° to

0° and by 24 hours. The dial is movable vertically through 180° of inclination for latitude, and is provided with a pair of alidades for bearings on terrestrial and celestial objects. M10062

This instrument is little more than a modern form of Walker's 1793 compass M2904. It was "invented" by D. Mac Gregor of Gt. Britain in 1875, and was still offered for sale in Heath & Co., 2 Tower Royal, Cannon St., London, Catalog of 1910.

195 English, c. 1940. Made of non-magnetic metals for a 9″ compass rim. A series of prisms, magnifying glasses and mirrors to enable a simultaneous sight on an object and the compass card. Marked "Husun Pat. appd For no. 4." In a mahogany carrying case. M9018

196 American, c. 1941. Cast brass 5¼″ diameter divided by degrees with cardinal and semi-cardinal points. Movable dial and vanes. Electrically lighted with single gimbal and rail bracket. Made by "Longines Wittnauer Watch Co., Inc." M8273

7. *Variation and Transit*

197 Variation compass. English, c. 1770. Base 8″ wide, 18″ long and 1″ thick, made of mahogany, three ivory levelling feet. Mounted on the base near each end is a mahogany arc with an inlaid ivory scale including 56°, divided to 10′; 0° at center. One scale is marked "Dollond London." Pivoted at the center of the base is a mahogany top with arc-shaped ends, each of which has an ivory vernier scale including 20°, 0° at center, subdivided to 10′. The top is actuated by an ivory knob working against a catgut cord with an ivory tension screw at one end. An ivory microscope with cross hairs is mounted at each end for the precise alignment of the needle with the center line. Between the microscopes is the oblong needle box with removable glass top. The needle is a flat bar with rounded ends, 8″ long, ⅜″ wide by $\frac{1}{16}$″ thick. One end carries an engraved "N" and a centerline. The bearing is of brass, the upper end having a loop for a counterweight thread. The pivot pin appears to be steel held in a brass support. The pin can be adjusted to the centerline by four brass

set screws. Through the glass cover, over the pivot is a vertical ivory tube with a shieve on its top to suspend the needle counterweight.

Accompanying the instrument is a mahogany box fitted with a lead counterweight, two iron magnets, a reel of silk, a boxwood burnisher, an ivory implement (use undetermined), and a brass bar, the exact size and shape of the compass needle. There are spaces for the needle and for a spanner, missing.

Plate XXXI M1466

This instrument is not one used directly for navigational purposes, but on shore to find minute changes in the variation of the compass, a very necessary factor in all chart making.

198 Transit, American, c. 1880. To fit a 6″ compass. Made of brass with an 11″ telescope, 1″ objective with lens cap. Prismatic eyepiece with one clear and four ruby glass shades. Unmarked.

M2079

8. *Surveyor's*

199 American, c. 1730. Made of mahogany 8½″ x 4¾″ x ⅞″. Rectangular pewter card 5¼″ x 1¾″, marked with engraved fleur-de-lys at North and letter "S" at South. Engraved brass semicircle 3¾″ diameter divided quadrantly by degrees inlaid on upper surface. Alidades made of brass ⅝″ wide, ⅛″ thick, $8\frac{11}{16}$″ long, $4\frac{5}{16}$″ high, pivoted on a brass thumb screw opposite 90°, double vertical slit, and vertical thread peep sights. Needle 5″ long flat elongated lozenge with a half moon at North, cross at South, brass bearing. A needle stop once fitted is missing. Brass fitting for Jacob staff. Plate XXXII M1518

200 American, c. 1750. Boxwood disc 6⅛″ diameter, with two projections for alidades; 7⅜″ long over-all. Engraved 32 point card divided quadrantly by degrees, marked "Made by North Ingham in Boston in New England." Fleur-de-lys North, decorated East. Each cardinal and semi-cardinal point bears the name of a planet; "Saturnus" [NE], "Jupiter" [E], "Mars" [SE], "Sol" [S], "Venus" [SW], "Mercurius" [W], "Luna"

[NW]. In the center left is a seated figure of Britannia, crowned, with a castle, and to the right, a brig under full sail. Needle 4⅝″ long, arrow point at North, cross at South, brass bearing cap. A brass ring ¼″ x 4¾″ diameter inside graduated quadrantly by degrees is cemented around the inner rim of the wooden frame. One sheet brass alidade 2″ high at North with vertical cross hair, and an identical alidade of zinc, obviously a replacement. A pine cover also serves as a top for a Jacob staff.

Plate XXXII M10526

201 American, before 1767. Made of fruitwood, 12¼″ long over-all, 1″ thick. Under glazed top, card of engraved paper 4⅞″ diameter, 32 point, North decorated with fleur-de-lys, East on proper side decorated with scrolls, marked "Made and sold by James Halsy near ye Draw Bridge in Boston. New Engld," a crown in the center, divided quadrantly. Needle 4½″ long, flat elongated lozenge shape, half-moon at North, cross at South, brass bearing. Pivot pin brass with steel point. Two wooden alidades 4″ high, each with vertical slit and vertical linen thread peep sights. Wooden socket for Jacob staff. White pine cover, held in place with two leather ties, with its top decorated with an incised 8 point compass rose. Plate XXXII M37

202 American, c. 1780. Made of mahogany 9″ long over-all, compass bowl ⅞″ thick, sight arms ⅜″ thick. Bowl octagonal 5¾″ glazed top. Circular card of engraved paper 32 point, fleur-de-lys at North, Maltese cross at proper East, marked "Newell maker East End of the Market Boston," divided quadrantly by degrees. Needle flat double lozenge 4½″ long marked "N" and "S," brass bearing. Sights missing, no socket for Jacob staff.

Plate XXXIII M9313

203 English, c. 1800. Made of brass 11½″ long. Silvered dial, marked "J & I Hardy London," 8 point, elevated silvered scale divided quadrantly by degrees. Needle flat 3″ long, double lozenge shape, blued, marked "N" and "S" in gold. Needle stop. Two brass removable alidades 4⅛″ high with slit and vertical cross hair peep sights in each. Socket for Jacob staff. En-

closed in a well-made pine box with label "Charles Newell Mathematical Instrument Maker No 11 Merchants Row, East End of the Market Boston . . ." Plate XXXIII M4689

204 American, c. 1810. Made of mahogany 15¼" length over-all, ¾" thick. Under glazed top, card of engraved paper 5½" diameter, 32 point, North with decorated fleur-de-lys, marked "Wightman Sculp," East on proper side decorated with spread eagle, shield on breast, roses in right claw, arrow in left, masonic square and compass over shield, divided quadrantly by degrees. Needle 5" long flat, double lozenge shape, marked "N" and "S" in gold, brass bearing. Two wooden alidades 5⅜" high each with vertical slit and vertical horse hair peep sights. Wooden socket and thumb screw for Jacob staff.

Plate XXXII M10266

205 American, c. 1810. Made of brass 15⅞" length over-all, 9$\frac{1}{16}$" wide over-all. Dial 7" diameter, 8 point, North with fleur-de-lys, East and West reversed, elevated brass scale divided by 30′ quadrantly. Dial engraved "W^{m} Davenport, Maker Philada." Needle 5⅞" long, vertical bar sweeping up to scale, wire wound on South end, crystal bearing enclosed in brass. Needle stop. Compass alignment may be adjusted by rack and pinion to a vernier scale on the frame. Counter for sixteen courses. Four removable brass alidades North and South, 6¾" high, East and West 6" high, each with two vertical slit peep holes. Socket for Jacob staff. Holes drilled in base for a level which is missing.

Plate XXXIII M1822

206 American, c. 1830. Brass case with cover. Dial 5" diameter, engraved brass divided quadrantly by 10°, fleur-de-lys North, marked "J. & H. M. Pool, Easton, Mass." Elevated ring divided by 1°. Vertical flat bar needle, North indicated by brass wire around the needle. Agate bearing. Automatic needle stop. Brass frame 12$\frac{13}{16}$" long with two removable alidades 5¼" high, pierced with vertical slits and six peep holes. Two spirit levels and socket for fastening to support. Pine box, leather covered with printed label "J. & H. M. Pool, Easton, Mass. Makers of

Surveyors and Leveling Instruments, Among which are Common Compasses, Compasses on Rittenhouse's Plan; Compasses on Pool's Improved Plan; Balls and Sockets; Tripods; Chains; Dividers; Drawing Pens; Rules; Scales; Squares; Targets; Common Protractors; Pool's Improved Protractors, &c. &c. Repairing done in the neatest manner. All orders gratefully received and promptly attended to." Jacob staff: mahogany 1¼" x 49", ball and socket top, steel shod point. Mahogany tripod, rigid legs 48" long, brass disc top.

Plate XXXIII M11112

207 American, c. 1940. Brass case painted olive drab, 5" diameter. Elevated silvered metal scale divided by degrees from 0° at North to 360°. East and West reversed. Two spirit levels on base. Needle flat lozenge shape 3⅞" long, wire wound at South end. Jewelled bearing. Needle stop. Two hinged brass alidades 2¾" high, fixed at North and South, slit in South sight, vertical metal bar in North sight. Brass socket for Jacob staff. Marked "Brunson Inst. Co. Kansas City, Mo." M8948

9. *Compass Cards*

208 Compass card plate. American, c. 1808. Copper plate 8" square signed "Callender Sp." Marked "S. Emery Salem," used by Emery for the manufacture of compasses. Fleur-de-lys at North. Scroll decorations at East, divided quadrantly by degrees. Illustrated on title-page. M3770

10. *Miscellaneous*

209 Course indicator, c. 1900. Hardwood disc 8¾" diameter, ½" thick with 128 point compass rose painted in black on white background, crude fleur-de-lys North, indicator hand missing. M6596

Removed from the wheelhouse of S. S. *Eduardo,* wrecked on Old Man Island, Cutlers Harbor, Maine.

210 Bearing circle. English, c. 1900. A brass ring with 360 teeth on upper surface, every tenth tooth numbered clockwise. A revolv-

ing brass dial 13¾″ diameter, graduated 0° to 360° by 5° with cardinal and semi-cardinal points lettered. Pivoted at the center is a celluloid hand and two brass hands. Each of the latter has a celluloid arm sliding along it. Each brass hand has a tooth which when engaged with the outer rings holds the hand in position. M6534

Said to have been the invention of the Prince of Battenberg.

211 Compass corrector. American, 1931. Plastic disc 6″ diameter, with printed 128 point 360° compass rose. Pivoted in the center is another plastic disc 4⅜″ diameter, with printed directions for using the device. Marked "Adams Variation-Deviation Corrector, copyrighted 1931 by Ashley D. Adams." In pine box with label: "Adams Corrector, supplied by Ashley D. Adams, Boston Yacht Sales Co., Inc. 126 State St. Boston." M9473

III. Instruments of Time, Speed and Distance

The measurement of time, speed and distance has always presented unusual problems at sea. One of man's first known timekeepers, the *sandglass*, was even less accurate in the damp air afloat than it was ashore. He could not count the number of his heart beats while his craft traveled between two points, because off-shore there are no fixed points. Nor, to measure distance, could the seaman count the number of paces between two ports as he could between two towns on land. If the hours of labor aboard had been the only call for a timekeeper, the sandglass would have sufficed. But as early as 1522 it was recognized that the determination of longitude depended upon an accurate means of telling time. Even when mechanical clocks were invented, they would not function on board ship as well as on land; a pendulum needs a stable base on which to work, and the first spring-driven clocks and watches were too crude to withstand temperature and position changes and still maintain any degree of accuracy. An error of a very few seconds of time produces a mistake of many miles in fixing a vessel's position. The first accurate *chronometer* was made by John Harrison, an Englishman, in 1735, but it was not accepted until about 1773 when Harrison was given a prize totaling £20,000 for his timekeeper. Another sixty years were to elapse before chronometers became cheap enough for most merchant skippers to buy. In fact, they were not issued to British naval vessels until 1825 and to those of the United States until 1826. The earliest known chronometer made in the United States was that by William Bond of Boston in 1812. Even so, down to the twentieth century, the sandglass remained part of the mariner's equipment, although it was used only with the "chip log," the ship's speedometer.

Sundials had little or no place afloat, but a device for telling time by the stars, the *nocturnal*, became almost exclusively a mariner's tool. Given only the date, on a clear night anywhere in the Northern hemisphere, local time could be determined with greater accuracy by a nocturnal than by the watches of the period, and in addition it gave the correction necessary for the calculation of latitude by observation

of the altitude of the North Star, one of the two most important early methods used by navigators. Although as a time teller the nocturnal dates back to the dawn of history, when watches began to have some degree of accuracy it dropped out of navigation manuals.

When the *ship's clock* with striking bell was produced has not yet been determined. There is a possibility the first bell-striking clocks were made by Pierce of Honiton, England, about 1785. It is known that Morris Tobias, a London clockmaker, patented in 1812 a timepiece to show time by bells, but this apparently was nothing more than a form of dial giving the number of bells to be struck instead of the numbers of the hours. Definitely, clocks striking bells were being sold by Bliss of New York in 1878.

The first known device to measure speed afloat was the "*Dutchman's Log*"—a stick or chip of wood thrown overboard at a marked point on the vessel's rail in the bow and timed by counting until another marked point near the stern sailed past the float. A simple calculation provided an estimate of speed from which an estimate of the distance traveled could be made. Engraved on a Dutch tobacco box is a table to make the conversion of the count to speed. About 1574 the *chip log* was first described by William Bourne, an English mathematician and navigator. The timepiece used in connection with it was a sandglass measuring 14 or 28 seconds. When the Pope divided the world between the Spanish and Portuguese, to know how far East or West of the Demarcation Line their vessels were became important. Since determining longitude by any means was then impossible other than by dead reckoning, various forms of mechanical logs were devised. Some dated back to the late fifteenth century, but the first practical inexpensive one did not appear until the nineteenth century. The chip log maintained its place aboard ship for another fifty years. Many forms of ship's speedometers or recording logs are in the Collection, along with sandglasses and a very rare clockwork log timer made about 1800.

A. Ring Dials

212 English, c.1680. Brass, marked "Walter Henshaw at the Globe in the Hermitage Morefields," 5⅜" diameter. Meridional ring

marked for 80° North, 90° South. Equatorial ring marked for five minutes. Bridge divided to two days on one side; on the reverse, declination in 30′ graduations on one edge, zodiac on the other. Altitude scale divided to 30′.

Plate XXXIV M2769

213 French, c.1700. Silver, marked "Delure Paris," 4 1/16″ diameter. Latitude scale for both hemispheres on opposite quadrants. Equatorial scale divided to quarter hours; bridge engraved "Declinaison De Soleil" in degrees and signs of zodiac on one side, on the other to five days by calendar. Altitude scale to 1°. Latitudes of twenty-one European cities engraved on the rings.

Plate XXXIV M10325

B. Nocturnals

214 English, 1724. Boxwood, marked "Both Bears" and on the pointer "Nath[ll] Viall 1724." Length over-all 8 5/8″, diameter 4 3/8″. North Star corrections on reverse.

Plate XXXV M468

Nathaniel Viall was a Boston mariner about 1699-1730.

215 English, eighteenth century. Boxwood, marked "Both Bears." Length over-all 8 3/8″, diameter 4 1/4″. North Star corrections on reverse. M507

216 American, eighteenth century. Mahogany, non-professionally made. For both bears. Length over-all 7 1/2″, diameter 5″. North Star corrections for Great Bear only on reverse. Reverse has a brass pointer with five points, use unknown. M3947

217 English, eighteenth century. Boxwood, marked "Both Bears." Length over-all 8 1/8″, diameter 4 1/4″. North Star corrections on reverse. Plate XXXV M3607

218 English, late eighteenth century. Boxwood, marked (with stamps) "Both Bears." Diameter 4 1/4″. Handle damaged, marked (with stamps) "S.R." Pointer marked (with engraved

letters) "A Black Squirrel," meaning unknown. North Star corrections on reverse. M9452

Once owned by Nathaniel Bowditch.

218A American, c. 1943. Waterproof cardboard 4⅝″ square with printed circle 4½″ diameter divided and marked as days of the year. Fastened to the center with a hollow rivet is a 3¾″ diameter volvelle divided by ten-minute intervals into the hours of day and night. Marked "Higgins Star Clock Higgins Industries, New Orleans, La." North Star around the rivet, diagrams of Big Dipper and Cassiopeia in proper relative positions. On the reverse, are 90° divisions by 1° forming a quadrant when a string and weight are attached to the apex of the quadrant. Directions for finding latitude by the North Star and for finding local time. Designed by Roy K. Marshall, Fels Planetarium, Philadelphia. Used for survival navigation during World War II. M11559

C. Sand Glasses

219 Watch glass, American, c. 1800, four hours. Two-piece bottle, red sand filled. Frame 13½″ high, pine ends square 7″ x 7″, six turned spindles. Plate XXXVI M9467

220 Time glass, French (?), eighteenth century, one hour. Four two-piece globular bottles, white sand filled, giving 15, 30, 45, and 60 minute periods. Tin case with doors, 5¼″ x 9″. M3112

221 Log glass, American, c. 1800, 14 seconds. Two-piece cone-shaped bottles, red sand filled. Frame 5″ high, oak disc ends 3″ diameter, four square pine spindles. Plate XXXVI M809

222 Log glass, American, c. 1800, 14 seconds. Two-piece bottle, yellow sand filled. Frame 5½″ high, oak disc ends 2¾″ diameter with four square spindles. A split oak wythe inside the spindles holds the bottle in place. M9468

223 Log glass, American, c. 1836, 14 seconds. One-piece globular bottle with cork stopper, black sand filled. Frame mahogany 4½″ high, disc ends 2⅝″ diameter, with four turned spindles. Label printed on paper on one end reading "Merrill & Davis New York. Keep this [the cork] end up 14 seconds 157 South Street." Plate XXXVI M3945

224 Log glass, American, c. 1836, 28 seconds. Companion to M3945. One-piece bottle with cork stopper, black sand filled. Frame mahogany 4½″ high, disc ends 2½″ diameter, with four turned spindles. Printed paper label "Merrill & Davis New York. Keep this [the cork] end up. 28 seconds 157 South Street." Plate XXXVI M3946

225 Log glass, American, c. 1860, 14 seconds. One-piece bottle, blown closed, red sand filled. Frame 5½″ high, beech disc ends 2¾″ diameter, one stamped "14," three turned spindles. M10757

226 Log glass, English, c. 1860, 14 seconds. One-piece globular bottle, black sand filled, cork stopper. Frame 4¾″ high, mahogany disc ends 2¾″ diameter, four turned spindles. Taken from C.S.S. *Florida,* 1863. Plate XXXVI M2374

227 Log glass, English, c. 1860, 28 seconds. One-piece globular bottle, black sand filled, cork stopper. Frame 5″ high, mahogany disc ends 3″ diameter, with four turned spindles. M2222

228 Log glass, American, c. 1890, 14 seconds. One-piece elongated globular bottle, filled with iron filings, cork stopper. Tubular brass case 1″ diameter by 3½″ long, cut away on two sides, disc ends stamped "14." Plate XXXVI M774

D. Log-timers

229 Log-timer, English, c. 1790, 14 and 28 seconds. Clockwork device marked "W^m^. Lovelace Hoxton," consisting of a balance

wheel and crown escapement which rings a gong at 14 seconds and 28 seconds. The power is derived by allowing the instrument to act as its own weight falling along a chain held by one hand thereby winding up a spring. Pulling a cord starts the mechanism. Enclosed in a mahogany case 4″ x 4″ x 4½″ high, with a glass pane on each side, solid top and bottom.

Plate XXXVII M26

Given to the East India Marine Society in 1803.

230 Dutchman's log-timer, Netherlands, 1729. Tobacco box, made of brass, rectangular with semi-circular ends 6⅜″ long x 1¾″ wide x 1¼″ deep. On the top is engraved a representation of Julius Caesar and the words, "45 before Christ," at the other end Pope Gregory and the date 1582, the effective dates of the Julian and Gregorian Calendars. Between is a perpetual calendar and the supposed date of the box, 1729. On the bottom is engraved the head of Amerigo Vespucci (?) and the date 1497, and a speed table by which a chip of wood tossed over the side of the vessel was timed by counting rythmically as the chip traversed the distance between two marks on the vessel's side. On the face of the box is the name of a navigation school "Regt Door Zee" in Amsterdam run by one Pieter Holm, the designer of the box. Plate XXXVIII M9080

E. Chronometers

231 English, marked "Brockbanks London No. 3493." Pair case 3″ diameter inner case silver gilt hallmarked "1792-3" maker indecipherable, outer case, pinchbeck. Second hand replaced. Plain key. In a three-part mahogany box 5¼″ x 3¾″ x 2½″ with green velvet pad for the instrument.

Plate XXXIX M10864

232 English, c. 1815. Silver dial 3¾″ diameter, engraved on dial "Wind Daily M. J. Tobias & Co. Liverpool 105." "A new balance and balance spring applied and adjusted by T. S. Negus & Co. 84 Wall St. N. Y." Hour, minute and second divisions.

No power indicator. Brass case and gimbals. Mahogany three-part box 7½″ x 7½″ x 7¾″ with inlaid brass plate marked "R. R. Crocker," and ivory plate marked "105." Rating certificate of James S. Kelley & Son, New Bedford, Mass., dated 7 June 1892, "Bk *Progress*." Circular paper label: "Thomas Tennent San Francisco" pasted in box top.

Plate XXXIX M867

R. R. Crocker was master of a New Bedford whaler as early as 1807 and part owner of whalers until 1841.

233 English, c.1820-30. Silver dial 4″ diameter, engraved "French Royal Exchange London N° 4985." Hour, minute and second divisions with power indicator scale 0 to 52. Three-part mahogany case with an unmarked inlaid brass plate on top and an unmarked ivory plate on front. Brass case and gimbals. Case 6½″ x 6½″ x 6¾″. No key. M800

Said to have been used on ship *Rousseau* of New Bedford.

234 English, c.1860. Silver dial 5″ diameter, engraved "Barraud 41 Cornhill Maker to the Royal Navy, London N° 1870." Hour, minute and second divisions with a 56 hour power indicator. Silver plated case and gimbals. Silver intertwined dolphin-shaped tipsy key. Three-part mahogany case with brass inlaid edges 6⅝″ x 6⅝″ x 7″. Printed label: "Blair & Son, 45 Prince Street Bristol." Inlaid brass plate on top engraved "Geo. W. Poole." An unmarked pearl shell plate on front. M4124

235 English, c.1860. Silver dial 4⅝″ diameter, engraved "Frodsham late Parkinson & Frodsham 50 Castle St[t] Liverpool. 2267." Hour, minute and second divisions with 56 hour power indicator. Brass case and gimbals. Plain tipsy key. Three-part rosewood case 6⅞″ x 6⅞″ x 7¼″ with plate marked "Frodsham, successor to (Parkinson & Frodsham) maker to the Admiralty, London," and ivory plate marked "2267." Mahogany padded carrying case. Twenty-one rate certificate from Bombay, Calcutta, Hong Kong, Rio de Janeiro, Liverpool, Cardiff, Hamburg, San Francisco and Boston, dating from 1864 to 1910. M2267

236 American, c.1870. Silver dial 4¾″ diameter. Engraved "T. S. & J. D. Negus 100 Wall St. New York, No. 831." Hour, minute and second divisions and 56 hour power indicator. Brass case and gimbals. Plain tipsy key. Three-part rosewood veneer on mahogany case 7⅜″ x 7⅜″ x 7⅜″. With padded mahogany carrying case. M2988

237 American, c.1880. Silver dial 4¾″ diameter. Engraved "T. S. & J. D. Negus New York No. 1675." Hour, minute and second divisions with power indicator scale 0 to 56. Brass case and gimbals. Plain tipsy key. Three-part rosewood case with inlaid brass corner pieces, 7¼″ x 7¼″ x 7½″. Inlaid brass plate on cover and celluloid plate on front, both unmarked. Rating certificate from Negus dated 14 May 1891. M2989

238 English, c.1893. Silver dial 4¾″ diameter, engraved "Dent Maker to the Queen 61 Strand & 4 Royal Exchange London. N° 46433." Hour, minute and second divisions with 56 hour power indicator. Brass case and gimbals, plain key. Three-part mahogany case with top name plate missing, ivory plate on front marked "Dent 46433." Paper label of "E. Dent & Co." pasted in top. M3593

This instrument is accompanied by a letter from Messrs. Dent stating that the instrument had been sold to the Spanish Government in 1893, and by an affidavit dated 2 June 1899 from J. W. Bonner, a professional diver, stating that he recovered it from the Spanish cruiser *Infanta Maria Teresa*, sunk at Santiago de Cuba.

F. Clocks

239 English, c.1805. Enamel dial 4″ diameter, marked "Morris Tobias," hour and minute divisions. One day verge escapement with fusee. Back plate marked "Morris Tobias London N° 612." Brass case mounted on one gimbal, hanging brass sconce base 5½″ diameter. Plate XL M2649

240 American, c. 1870. 6″ tin dial, painted white, marked with a monogram "W C Co." Mounted in an octagonal mahogany veneer case is a cheap, spring-driven non-striking clock.
Plate XL M10409

Commonly used on American coasters and fishermen.

241 American, 1908. 12″ silvered dial with raised Arabic numerals marked "Chelsea Clock Co. Boston. Ships Bell." Brass case inscribed "From Salem Marine Society and East India Marine Society to U.S.S. *Salem*—1908." M3521

Returned by Act of Congress, 1930.

242 American, 1908. 8¼″ silvered dial, Arabic numerals marked "N 758. U.S.S. *Salem* E[ngineering] D[epartment]" and a shield marked "The Ashcroft Mfg. Co. New York 2740." Brass case. Plain brass key marked "Chelsea." M11051

243 American, c. 1910. 6″ silvered brass dial with hour, minute and second hands marked "Seth Thomas." Brass case mounted on a mahogany veneered pine back on the reverse of which is pasted a printed label "Day Lever Seth Thomas Thomaston, Conn . . ." with bell and two hammers below the clock case.
Plate XL M10638

G. Logs

244 Log chip, line and reel. Quadrant-shaped oak chip 4½″ radius, ⅜″ thick. Reel 12½″ long, diameter of end disc 6″, turned handle 4½″ long. Line ⅛″ cod line. Plate XLI M767

245 Log chip. Quadrant oak, 6⅜″ radius, ⅜″ thick, weighted with lead on the arc, ⅜″ braided flax bridle 20″ long, beechwood slip pin. M5664

246 Log chip. Quadrant oak, 6½″ radius, ½″ thick, weighted with lead on the arc. ¼″ manila bridle 40″ long, oak slip pin.
M10263

247 Mechanical log. American, c.1800. Cylindrical brass case 1⅞″ diameter, 6⅛″ long with brass dial marked by miles in 10s to 100. Case marked "Gould's Patent Boston No. 17." Four blade rotor with adjustable pitch, 7½″ long. Plate XLI M3154

248 Mechanical log. English, c.1857. Triangular nickel-plated device with horizontal and vertical stabilizer fins marked "Thos. Massey 4, Birchin Lane London 3382" and on dial cover "Thos. Massey's Improved Patent Granted Novr 1857." Three dials register 100 miles by 10s, ten miles by miles and one mile by eighths. 13″ long 5½″ wide over-all. Attached by ⅜″ manila line is a nickel-plated rotor, four blade, 15½″ long over-all. M3238

249 Mechanical log. English, c. 1866. Made of brass, marked "Walker's A2 Harpoon ship Log Patented 18th Sept. 1866." Three dials register 100 miles by 10s, ten miles by miles and one mile by quarters. Length over-all 18¼″. Four-blade propeller. In the original wooden packing box with instructions for use. Plate XLI M533

250 Mechanical log. American, c. 1867. Brass works case 6¾″ diameter, 2¾″ deep. White dial registers 0 to 100 miles and inner dial 0 to 1000 miles by 100s. Braided line. Four-blade propeller 9¼″ long. Dial marked "John Bliss & Co. New York Patented Nov 15 1864. Apr 2 1867." Galvanized sheet metal line spool 12″ diameter, 2″ thick. Plate XLI M3028

251 Mechanical log. English, c.1870. Brass tube 12″ long, 2″ outside diameter, enclosing three-blade rotor and gear train operating dials on exterior marked "The Liverpool Patent Log Alex. Walker & Co." White enamel dials register 150 miles by 10s, ten miles by miles and one mile by quarters. Embossed stamp "A. Walker & Co. Patentees [Arms of Great Britain] 72 South Castle Street Liverpool." Two stabilizer fins attached to the tube. Tube bears a stamped number "433." M9288

252 Mechanical log. American, c. 1890. Brass case, iron fly wheel, white enamel dial 2″ diameter, 1″ deep marked "Negus Patent Log." Dial registers fifty miles by miles and one mile by tenths. Four-blade copper rotor 6½″ long. In wooden case with directions for use. Braided ⅛″ cotton line and oil can. M3606

See also: Sounders M3579 and M10184.

IV. Miscellaneous Instruments

Here is found a miscellaneous group of instruments concerned with navigation in the broadest sense of the word. Included are the instruments devoted to meteorology, mathematics, instruction, drawing charts, plotting and pilotage.

The *traverse board,* developed in the sixteenth century, was a means of keeping a record of a vessel's course. Its use so far as can be determined was confined to Northern Europe, but occasionally it is found in American waters. In the hands of more literate seamen the *log slate* performed the same function and so did a finely-made instrument called a *trigonometer*. The result compiled by any means was transferred to the chart and log book to record the ship's dead reckoning position.

The *parallel rule* in its common form was invented by the Frenchman Mordante in 1584. *Protractors* in the form of half a compass rose were apparently first suggested by the English writer on navigation, Thomas Blundeville, 1589. The *station pointer* was first described by Murdock Mackenzie, a British hydrographic surveyor, about 1774.

Mechanical *sounding instruments*, all of them dependent upon some object being lowered to the sea floor on a line, began to be invented about 1800. Since they were seldom more accurate than the age-old lead and cost a great deal more, none of them were widely accepted by seamen. Lord Kelvin's machine was the exception, but it was used primarily for exploration or hydrographic work in great depths and was quickly out-moded when the echo sounder was devised.

The refracting *telescope,* although foretold by Roger Bacon in the thirteenth century, was first made by Dutch eyeglass makers about 1600. Soon after it was improved by Galileo. The achromatic lens was designed by Chester M. Hall of England in 1733 but he did not produce it for sale and the present form of telescope was the work of an English optical scientist John Dollond about 1758. All subsequent improvements were in better tubes or bigger and better lenses.

Devices to compute the time of high tide date back as far as the

thirteenth century. Frequently they were included as a part of the *nocturnal*.

Aside from the ancient abacus, the first important computer was "*Napier's Bones*," a device designed about 1617 by Lord Napier the original discoverer of logarithms. The set of "Bones" owned by the Museum once belonged to Seth Partridge, who translated Napier's description from Latin into English. The "Bones" accompany Partridge's own copy of the translation with his manuscript corrections. Following the work on logarithms by Napier and his disciple Briggs came many designs for computers: Edmund Gunter's *rule* in 1623; the true *slide rule* by Richard Delamain in 1630, improved by Mannheim in 1850; the *sector* also invented by Gunter about 1623.

The *mercury barometer* was invented about 1620 by the Italian scientist Torricelli, and while it became commonplace ashore in the late eighteenth century, the ship's barometer was not widely used until Adie invented his type called the "Sympiesometer," and Fortin the enclosed cistern. Examples of both are in the Collection. The *aneroid barometer* was invented by a Frenchman Vidie in 1845 and made popular by another Frenchman, E. Bourdon after 1849. Again one of the early instruments is to be seen.

The *thermometer* was the invention of Galileo about 1612. The Fahrenheit scale appeared about 1714, the Reaumur in 1731 and the centigrade was adopted in France in 1801, although it had been designed by Anders Celsius in 1742.

The *orrery*, a device for demonstrating the movements of the planets was a shoreside piece for teaching nautical astronomy. It was possibly the invention of, and at least was named for, Charles Boyle (1676-1731), the fourth Earl of Orrery.

A. Dead Reckoning Recorders

1. *Traverse Boards*

253 American, nineteenth century. Maple 15¾″ long over-all, by 8½″ wide by ¾″ thick. Graduation: thirty-two lightly incised points painted alternately red and blue with four holes in each, seven cords with copper wire pins remain, along with evidence

of an eighth cord. Speed table: six rows, eighteen columns of holes, eight cords with wooden pegs. Plate XLII M1427

254 French, nineteenth century. Plate brass fastened to a wooden backing. 18″ long over-all by 11⅜″ wide by ⅝″ thick. Graduation: thirty-two points each with eight holes. Over the compass rose from East through North to West are four rows of holes marked 0 at East and West to 90 at North inscribed "heurs du quart." Below these are inscribed on left "Derive Babord [Leeway port]" and on the right "Derive Tribord [Leeway starboard]." Speed table: eight horizontal rows of holes marked ½, 1, 1½, to 4 with ten vertical columns marked 1 to 10 with the word "Mille" above. Then labeled "Vents" eight rows marked ½, 1, 1½, to 4 with thirty-two columns marked "Nord ¼, NNE" through the compass points. Next a group of eight rows and ten columns marked as the first group with the word "Dixieme" above. The board is marked "Piegnante," the maker. Pins missing. Plate XLII M3354

2. *Log Slates*

255 American, c.1790. Double-faced black slate in pine frame 13¾″ x 9½″. One side of the slate engraved with columns headed "H[our], K[nots], F[athoms], Course, Wind, L[ee] W[ay], [blank]." The "H" column has a vertical row of numbers 1-12 and 1-12. Plate XLIII M1674

256 American, c.1810. Double-faced black slate in pine frame 15¾″ x 12¼″, with wire loop hanger. M1722

257 American, c.1815. Double-panelled wooden hinged case 10½″ x 10¼″, with copper corner braces, closing hook and rope beckets for hanging; painted black, marked in white paint "J. Crowninshield USN." The case contains two black painted pine frames with double-faced black slates, one hinged to each side of the case. The first is engraved in columns headed "H, K, F, Courses, Winds, Remarks on The [blank]" with the "H" column verti-

cally numbered 1-12 and 1-12. The other three sides of the slates are blank. Plate XLIII M10127

Jacob Crowninshield (1796-1849) was appointed Midshipman U.S.N. in 1815, commissioned a Lieutenant in 1825 and a Master Commandant in 1841.

258 American, c. 1830. Double-faced black slate in birch frame 12¼″ x 8¼″. With four broken pencils. M9825

259 American, c. 1850. Double-panelled hinged wooden case 14¼″ x 10″, painted green, containing two black slates each with engraved column headed "H, K, Courses, Winds, L. W., Remarks." The "H" column is vertically numbered 1-12 and 1-12. M3511

260 Chinese, c. 1850. Double-faced white porcelain in teak frame, 9¾″ x 7½″ with a leather pencil sheath attached to one edge. M3847

261 American, c. 1860. Double-panelled hinged maple frame 13¾″ x 9⅞″, containing two black slates. M869

Used on whaling bark *Progress*.

262 American, c. 1880. Double-faced black slate in birch frame stamped "The Blue Vein," 13″ x 9″, in a book-type binding of brown marbeled paper boards. M9863

262A Log Board. American, 1746. Pine plank 25½″ high, 17¼″ wide, ⅞″ thick, with semi-oval top 5½″ high, 12½″ wide, painted black with floral wreath and "1746" in cream paint in top, divided into six vertical columns lettered "H, K, H[alf] K[nots], C[ourses], W, [blank for remarks]." Horizontally divided into twelve parts marked under the "H" 2, 4, 6, 8, 10, 12, and again 2–12. Back unpainted. MB510

3. *Trigonometer*

263 American, 1824. Brass, two 5½″ diameter, 180° protractors divided by degrees and quarter compass points attached to one

end of a 12″ long base divided from the center to the end into one hundred equal parts. One protractor has a movable arm 9⅛″ long divided into one hundred equal parts. This protractor base forms the arm of the other protractor and will move along its center. The instrument will solve the trigonometrical problems of surveying and plain sailing. Marked "Patent."

Plate XLIII M2230

Designed by William Bolles.

B. Graphic Tools

1. *Straight Edges*

264 Ebony. 18″ long. One edge beveled. Unmarked.

Plate XLIV M8908

265 Ebony. 20½″ long with the name "Thos. Perkins" inlaid in dots of white bone or ivory. One edge beveled.

Plate XLIV M1883

Thomas Perkins (1794-1875) joined the Salem Marine Society in 1833.

266 Bird's-eye maple. 15″ long. Two opposing corners beveled.

Plate XLIV M7318

Traditionally made from the bowsprit of the *Flying Cloud*, when she was broken up at St. John, New Brunswick.

267 Rolling rule, Lignum Vitae. 14¾″ long, $\frac{13}{16}$″ diameter. Concentric circles turned on each end. M4289

268 Rolling rule, Lignum Vitae. 18″ long, 1″ diameter.

Plate XLIV M10281

2. *Parallel Rules*

269 Ebony. 18″ long. Plate XLIV M529

270 Lignum Vitae. 12″ with a scale marked "GHO." Figures from 0 to 90 cut by hand on one edge. M5613

271 Lignum Vitae. 13″. M855

Made from "dog" of mainyard of U.S.S. *Cumberland*, sunk by C.S.N. *Merrimac* March 8, 1862.

272 Sigsbie's Patent, U. S. Navy Pattern, 1896. Stamped "Keuffel & Esser Co. N. Y." Number "1796." Ebonized boxwood, 15″ long. Plate XLIV M8986

273 English, c. 1900. Field's rolling ruler. Bronze, 18″ long. Marked "U. N. W. Birmingham." Plate XLIV M8798

3. *Dividers*

274 English, c. 1700. Steel one hand dividers, 6¾″ long. Plate XLV M2599

275 English, c. 1700. Steel one hand dividers, 8″ long. Plate XLV M2600

276 English, eighteenth century. Brass with steel points, one removable, 5″ long. M5006

277 English, c. 1800. Four leg dividers 11 13/16″ long, marked "J & W Watkins Charing Cross London" "Patent." Legs are marked respectively "A," "B," "C," and "D" on each side. Brass with steel points. Plate XX M474

Used in connection with M473 half circle in lunar observations for longitude.

278 American, nineteenth century. Brass, steel points 6″ long. Plate XLV M8923

279 American, c. 1940. Chromium-plated metal with adjustable needle points, marked "Charvos USA." 7″ long. In imitation leather case marked "Navigator's Case U. S. Navy" with pencil pointed compass and screw driver. Plate XLV M8798

280 Proportional dividers. German, c. 1900. Bronze with steel points, 7¼″ long and both lines and circles, rack and pinion cen-

ter. Marked "Jansson Germany." In blue velvet-lined leather case. M10543

4. *Protractors*

281 English, eighteenth century. Brass semi-circle 6″ diameter graduated by degrees 0 to 180 and 180 to 0. Engraved. Plate XLV M8353

282 American, c. 1840. Brass, three spoke wheel-shaped marked with stamps "Thos. Tennent, Newburyport, Maker." Divided by degrees 0 to 180 to 0. A vernier to produce 5′ readings is attached. M3075

This instrument does not appear to be complete.

283 American, 1853. Semi-circle made of heavy cardboard 6″ diameter with printed half of 32 point compass rose, the outer edge graduated by degrees 0 to 90 to 0. In the center point is a thread. Marked "Marine-Protractor William Leavitt Navigation School Salem. Published by Henry Whipple & Son, Book and Chart Seller 190 Essex St Salem, Mass." On the reverse are printed directions for use, the copyright 1853 and Whipple's advertisement of Charts, etc. Plate XLV M5803

284 English, c. 1860. German silver stamped "Lilley & Son London Patentees & Manufacturers," "N° 151." Rotating disc 4″ diameter marked with cardinal and semi-cardinal letters, divided by degrees quadrantly, set in a base 4⅞″ long. In seal skin case. Plate XLV M4032

285 Mechanical course protractor, c. 1900. Brass base 3½″ diameter with soft rubber friction pad. 128 point compass rose dial with two pointers attached by gears to a 17½″ celluloid rule pivoted at the end of an 11″ brass frame. When the rule is moved its direction is indicated on the dial. Much like M10063. Plate XLVI M11020

286 American, 1907. Metal compass rose 128 points and 360°, 3¼″ diameter, marked "The Cole Course Protractor, Pat. Oct. 1907

M. C. Co. Sole Makers." To the rose is pivoted a brass rod arm 11½" long, on the end is pivoted a clear plastic arm 17¼" long. The arm by means of bevel gears and a shaft actuates two pointers on the rose indicating the angle of the plastic arm. In a mahogany box with the label "Charles C. Hutchinson, Boston, Mass." M10063

5. *Drafting*

287 English, c. 1800. Upright black fishskin case enclosing brass dividers 6¼", steel points, one removable, pencil point and pen point; brass dividers 5¼", fixed steel points; steel ruling pen with removable brass handle containing a pricker, 5¼" long; brass protractor; boxwood scale 6" long, and folding boxwood Gunter's sector 6" long. Spaces for several other instruments, all missing. Case lined with English newspaper. M6166

288 English, c. 1800. Upright black fishskin case enclosing brass dividers 4¾", fixed steel points; ruling pen; pencil point and pen point for large compass which is missing; bow pen; brass protractors; screw driver; boxwood scale; and sector. Case lined with English newspaper. Plate XLVII M1026

289 English, c. 1800. Upright black fishskin case, lid lined with red velvet, enclosing brass protractor; ebony parallel rule; ivory English sector; ivory scale; brass dividers 5¾", steel points, one removable; pen; dotting pen and pencil to fit; bow pen; ruling pen with removable brass handle containing a pricker; combination spanner and screw driver. Case lined with English hymn book pages. Plate XLVII M4031

290 English, c. 1800. Upright black fishskin case enclosing brass protractor; parallel rule; brass dividers 5¾", with steel points, one removable; pen point to fit; brass dividers 5" with steel points; steel ruling pen with removable handle containing a pricker. Spaces in case for missing instruments. Case lined with wallpaper. M1432

291 English, c.1800. Upright black fishskin case enclosing brass dividers 6″ with steel points, one removable; pencil and pen points to fit; brass dividers 5¾″ with steel points; steel ruling pen with removable brass handle containing a pricker; and small screw driver. Space for scale which is missing. Case lined with marbled paper. M3776

292 French, c.1830. Burl walnut case with pearl shell inlay engraved "W[illiam] M^{c} K[ibbin]" enclosing green velvet lined tray holding brass dividers 6½″ with steel points, one removable, with extension bar, pencil point and pen point; brass dividers 4½″ with steel points, one removable, with pencil and pen points; brass dividers 4½″ with fixed steel points; brass dividers 3½″ with steel points, one removable; pen compass 2¾″; ruling pen 6¼″ with ebony handle containing a pricker; and a brass plumbbob. In bottom of case is a parallel ruling pen; brass French sector marked "Dumotiez a Paris;" and a folding square which will make a plumbbob level, graduated in English feet, Rhine feet, centimeters and French feet, marked "Pixii Dumotiez a Paris." In a pocket in the lid is a brass semi-circular protractor graduated to 30′ marked "Pixii Dumotiez a Paris," and a horn semi-circular protractor same graduation and marking. An engraved label pasted in lid "Pixii Neveu et Successeur de Dumotiez . . . Rue de Jardinet 91, N^{o} 2 . . . a Paris."

Plate XLVII M10107

William Mc Kibben was a Philadelphia ship-master about 1830-40.

293 French, c.1850. Flat rosewood case enclosing blue velvet lined tray holding brass and steel proportional compass 6½″; brass dividers 6½″ with steel points, one removable with extension bar, pencil point and pen point; brass dividers 4½″ with steel points; brass dividers 4″ with steel points, one removable with pen point and pencil point; brass dividers 3⅜″ with steel points, one removable with pen point (pencil point missing); and ruling pen. Case lining stamped "Compas Superieurs, Brevetes, S.G.D.G." M3492

6. *Station Pointers*

294 Origin unknown. Heavy brass straight edge 16″ long, 1½″ wide, ¼″ thick, with dovetail slot along center line in which moves a brass sixteen point semi-circular protractor marked "N," "NE" and "NW." To its center are pivoted two arms with arrow point ends, one brass 15¼″ long, the other black rubber-like substance 15½″ long. Plate XLVI M9304

When one point of each arm is set on the bearing, the other point indicates the reading on the protractor.

295 American, c.1950. Clear plastic. 128 point compass printed on 5⅛″ square with three pivoted arms 19″ long. Marked "Manufactured by Marine Compass Co. Hanover, Mass." M9245

C. Sounders

296 Hand lead. American. 15 lb cone, 10½″ long with ¾″ manila grommet through a pierced end. No arming hole. Plate XLVIII M810

297 Hand lead line and reel. American. ⅜″ manila line twenty fathoms long, eye splice at end, 3½″ oak toggle seized in 4′ from the end, marked: 1 fathom, 1 leather; 2 fathoms, 2 leathers; 8 fathoms, 1 leather; 12 fathoms, 2 leathers; 14 fathoms, 1 leather with hole; 18 fathoms, white rag; 20 fathoms—end. Pine reel 2¾″ x 11½″. Handles 5″. End discs replaced. Plate XLVIII M2563

298 Deep sea lead. American. Octagonal lead cone 24″ long, weight 80 lbs. Eye in upper end for line, arming hole in bottom. Plate XLVIII M811

299 Mechanical sounder. English, c.1800. Flat brass plate frame 8⅜″ x 4⅞″ marked "Edw Massey Emp Patentee London 101076 Manufactory 3 Tysoe St^{t}. Clerkenwell." Dials register from 1 to 10 fathoms and from 10 to 150 fathoms, when rotor is turned. Gravity stop to prevent the rotor from working after

the sounder strikes bottom. Iron bar for attaching line is missing. In original mahogany case with beeswax lubricant and spare parts. Plate XLVIII M2986

300 Mechanical sounder. English, mid-nineteenth century. Cast bronze frame 9″ x 5″ marked "Edw[d] Massey's New LLL Patent Frictionless Sounder (226)." Registers from 0 to 115 fathoms. Four blade rotor. Gravity stop.
Plate XLIX M3439

301 Mechanical sounder. English, mid-nineteenth century. Cast bronze egg-shaped frame 9¾″ x 4½″ marked "T. Walker's Patent 5799." Dials register 2 to 30 fathoms and 30 to 150 fathoms when five blade rotor is turned. Automatic stop.
Plate XLIX M3578

302 Mechanical deep sea sounder. American, mid-nineteenth century. Cast brass egg-shaped frame 10¼″ x 5⅛″. Unmarked. Double dial registers 0-100 and 0-100 times the first dial. Automatic ratchet throw-off for rotor. Plate XLIX M3579

May also be used as a log.

303 Mechanical sounder. English mid-nineteenth century. Brass frame 8½″ x 4⅞″. Marked "Edwd Massey LLL Patentee London 2452." Two dials register 1-15 fathoms and 15-225 fathoms. Gravity rotor stop. Four blade rotor. In original pine box with maker's instruction, marked in ink "from H. T. Lambert, 1 America Square, London." M6195

Seems to be an improved model of M2986, and forerunner of M3439.

304 Mechanical deep sea sounder. American, 1860. Melon-shaped bronze frame 13″ x 6″. Marked "E & G. W. Blunt New York 46," and a rotor blade "Patented Nov 27th 1860." Complicated dials, one marked 0-25 fathoms, the second 0-2000 fathoms.
Plate XLIX M10184

By shifting the gear train, the sounder becomes a recording log. This is a more highly developed instrument but similar in design to M3579.

305 Pump well sounder. American, c.1850. Iron bar ¾″ x ¼″ x 26½″ graduated in inches with length of marline spliced through hole in end. M797

D. Telescopes

306 Dutch (?), Japanese (?), late seventeenth century or early eighteenth century. Tapered copper tube made up of four sheets beaten to shape and soldered together on sleeves, 59½″ long closed, 63″ open. Objective missing. Tube 2½″ diameter outside. Single hammered sheet brass draw with turned wooden eye piece. Unmarked. M1528

Used on the hills at Nagasaki, Japan, to watch for the approach of foreign vessels.

307 English (?), c. 1740. Wooden tube reverse tapered marble-grained in red and black paint 37″ long closed, 38⅜″ open. Carved initials "T[homas] N[ixon]." No draws, focus made by screw thread on occular lens cell. ¾″ objective with sliding lens protector. Plate L M10688

Thomas Nixon was a Massachusetts military officer in the French and Indian Wars.

308 English, c. 1770. Octagonal reverse tapered mahogany tube 25¾″ long closed, 32¾″ open. ½″ objective with sliding lens protector. Single brass draw. Unmarked. M9451

Once owned by Nathaniel Bowditch.

309 English, c. 1775. Octagonal reverse tapered wooden tube covered with homespun linen with crown knots at ends, 25½″ long closed, 31¼″ open. ⅞″ objective. Single brass draw. Unmarked. Plate L M23

Taken from a British brig off the Irish Coast by Captain James Barr of Salem during the American Revolution.

310 French, c. 1780. Rochon's telescope. Parallel brass tube 24¾″ long closed, 30¼″ open. 1½″ objective with cap. Single brass

draw marked "Bardon Opticien 55, rue de Chabrol. Paris." Rack and pinion device on tube moves a pair of prisms in the tube registering on a scale of distances in minutes of an arc from 0′ to 60′ with a vernier to 6″. In padded mahogany case. M2398

311 English, c. 1790. Tapered wooden tube 20¼″ long closed, 33″ open. 1⅜″ objective with sliding lens protector. Single brass draw. Marked on lens protector "Spencer Browning & Rust London." M1830

Once owned by Nathaniel Bowditch.

312 English, c. 1795. Tapered mahogany tube 38½″ long closed, 48½″ open. 1⅞″ objective. Single brass draw marked "W. & S. Jones 30 Holborn London." In mahogany box with extra occular lens. In cover engraved label "London Bought of W and S Jones N° 30 opposite Furnivals Inn, Holborn Removed from their old Shop No. 135 . . ." M9777

Originally owned by Capt. John Crowninshield, Salem master and privateer (1771-1842).

313 English, eighteenth century. Reverse tapered octagonal wooden tube covered with black painted canvas, 38¾″ long closed, 46″ open. ¾″ objective with sliding lens protector. Single brass draw marked within a floral wreath "Made by Jas. Chapman St. Catherine's London." M2657

314 English, eighteenth century. Octagonal tapered wooden tube (split repaired with brass hoop) 50¾″ long closed, 60″ open. 1½″ objective with sliding lens protector. Single brass draw. Unmarked. M1521

315 English, eighteenth century. Ten-sided tapered wooden tube covered with black painted canvas 37¾″ long closed, 46″ open. 1¼″ objective with sliding lens protector. Single brass draw. Unmarked. M10347

316 English, eighteenth century. Ten-sided tapered wooden tube 38¼″ long closed, 45¼″ open. 1¼″ objective with sliding lens protector. Single brass draw. Unmarked. M2294

317 English, late eighteenth century. Octagonal parallel maple tube 10½″ long closed, 17⅝″ open. ½″ objective with sliding lens protector. Single brass draw. Unmarked. M3269

318 English, c. 1830. Parallel brass tube covered with sail cloth 20¼″ long closed, 36″ open. 1⅞″ objective with shade and lens cap with sliding cover. Single draw marked "I. I. Messer, London, Impd. Day or Night." M11019

319 English, 1835. Parallel mahogany tube 8¼″ long closed, 17½″ open. ⅞″ objective with sliding lens protector. Two brass draws marked "J. F[rederick] A[llen]. 1835." M2388

J. Frederick Allen was a Salem ship-owner in 1834.

320 English, 1838. Parallel brass tube covered with brown leather 20¾″ long closed, 36¼″ open. 1½″ objective with shade and lens cap. Single draw marked "Dollond London Day or Night." "Presented to Capt. A. Richardson 'Ship Duchess d'Orleans' . . . Sept 1838." M5856

See No. 120.

321 English, c. 1846. Tapered brass tube covered with brown leather 26″ long closed, 37¼″ open. 1⅞″ objective with shade and lens cap. Single brass draw marked "Spencer, Browning & Co. London Improved." Cap inscribed "John F. Osgood from Cap. J. F. Webb Mar 27 1846." In mahogany box with inlaid brass plate monogrammed "J.F.O." Plate L M2717

John F. Osgood (1825-1894) joined the Salem Marine Society in 1892. J. F. Webb (1811-1861) ship-master joined the East India Marine Society in 1840 and the Salem Marine Society in 1845.

322 English, c. 1850. Tapered brass tube covered with brown leather with a celluloid-covered window enclosing a colored chart of Na-

tional flags, the Universal code flags for merchant and British naval services, 27½″ long closed, 42¼″ open. 2″ objective with sun shade. Single brass draw marked "Lilley & Sons London."
Plate L M3490

323 English, c.1850. Tapered brass tube covered with brown leather 27″ long closed, 38⅜″ open. 1⅞″ objective with lens cap. Single brass draw marked "Spencer Browning & Co London Improved." "U. S. Navy R27883." M8235

324 English, c.1850. Parallel brass tube covered with brown leather 20¼″ long closed, 35″ open. 1¾″ objective with shade and lens cap. Single brass draw marked "Spencer Browning & Co. London Day or Night." M4361

325 English, c.1850. Parallel brass tube 20½″ long closed, 35″ open. 1⅝″ objective with lens cap. Single brass draw marked "Spencer Browning & Co. London Day or Night." M3748

A note attached states it was purchased in Salem in 1855.

326 English, c.1850. Parallel brass tube covered with brown leather 20¾″ long closed, 35¼″ open. 1¾″ objective with shade and lens cap. Single draw. Unmarked. M8984

327 English, 1856. Tapered brass tube covered with black cloth 27¾″ long closed, 41″ open. 2″ objective with shade. Single brass draw marked "Spencer Browning & Co. London Made for W. S. Browning, 25 South Castle St. Liverpool Imp'd Pancratic," and inscribed "John F. Nelson Salem Mass. 1856."
M2585

John F. Nelson was a Salem master mariner in 1856.

328 English, 1858. Tapered brass tube covered with brown leather 27½″ long closed, 40½″ open. 2″ objective with shade and lens cap. Single brass draw marked "Spencer Browning & Co. London Improved," and inscribed "Token of gratitude from F. Torrey to Francis F. Wallis whose heroic exertions rescued the giver from drowning Nov 1st 1858." M2476

Salem Gazette, 1 November 1858. Narrow Escape—"On Tuesday morning, as barque *Wm. H. Shailer*, from Coast of Africa, was running for our harbor, when two or three miles S.E. of Half Way Rock, the second officer, Mr. Francis Torry, who was engaged in his duties at the bow of the vessel slipped overboard. The barque was immediately "hauled to," and the pilot (Mr Francis F. Wallis) jumped into his dory made for the drowning Man, and succeeded in catching him by the hair of his head, as he was sinking, and supported him until a boat from the barque reached the spot, when Mr. T. was taken from the water, much chilled and carried on board the vessel. . . ."

329 English, early-nineteenth century. Parallel wooden tube 20¼″ long closed, 35¼″ open. 1½″ objective with sliding lens protector. Single brass draw marked "Rd. Barry London Day or Night." M7368

330 English, early-nineteenth century. Parallel wooden tube covered with blue worsted cloth 20¾″ long closed, 36½″ open. 1½″ objective. Single draw marked "Owens Liverpool Night or Day." Lens protector missing. M817

331 English, early-nineteenth century. Parallel wooden tube painted red 20⅜″ long closed, 36¼″ open. 1⅜″ objective. Single brass draw marked "John Hardy & Sons London." Sliding occular lens protector, objective lens and lens cap missing. M10783

332 English, early-nineteenth century. Parallel wooden tube covered with sail cloth 20¼″ long closed, 35¾″ open. 1¼″ objective with sliding lens protector. Single brass draw marked "Bradford London Day or Night." M3445

333 English, early-nineteenth century. Parallel mahogany tube 20¼″ long closed, 36″ open. 1⅝″ objective. Single draw marked "I. Morley St. Catherine's London Day or Night." M8927

334 English, early-nineteenth century. Tapered wooden tube 25″ long closed, 39″ open. 1⅜″ objective with sliding lens protector. Single brass draw. Unmarked. M3251

335 English, mid-nineteenth century. Parallel wooden tube 14¾″ long closed, 36″ open. 1½″ objective with sliding lens protector. Double brass draw marked "G. Bracher London Day or Night." M8929

336 English, mid-nineteenth century. Parallel wooden tube 19½″ long closed, 35″ open. 1½″ objective with shade. Single brass draw marked "Harris & Son London Day or Night." M2348

337 American (?), mid-nineteenth century. Parallel wooden tube covered with coach whipping and crowns at ends, painted black 20½″ long closed, 36¼″ open. 1½″ objective with shade, cap missing. Single brass draw marked "E & G. W. Blunt, New York, Day or Night." "U. S. Navy R27803." M2555

338 English, mid-nineteenth century. Parallel wooden tube covered with black worsted cloth, held in place with four rows of Turk's-heads, 20½″ long closed, 35″ open. 1½″ objective with lens cap and shade. Single draw marked "Blachford London Day or Night." M9822

339 English, mid-nineteenth century. Parallel brass tube covered with black canvas with Turk's heads at ends 20⅜″ long closed, 35¼″ open. 1½″ objective with shade. Single draw marked "Dollond London." M10129

340 English, mid-nineteenth century. Parallel brass tube wrapped in twine 20½″ long closed, 35⅜″ open. 1½″ objective with lens cap. Single draw marked "I. P. Cutts Sons & Sutton Opticians to Her Majesty Sheffield." M5801

341 French (?), late-nineteenth century. Parallel brass tube covered with mahogany veneer 8¾″ long closed, 14¾″ open. ⅞″ objective with lens cap. Single brass draw. Eye piece engraved "Pickering Dodge Allen." M2389

Pickering Dodge Allen (1838-1863) was a Salem traveller and Army officer.

342 English, late-nineteenth century. Parallel wooden tube covered with brown leather 10½″ long closed, 33¾″ open. 1⅝″ objective. Triple brass draw marked "Pastorelli London Day & Night." M5982

343 English (?), late-nineteenth century. Parallel brass tube covered with black cloth 20½″ long closed, 36″ open. 1½″ objective with shade and sliding lens protector. Single brass draw. Unmarked. M3480

344 English, late-nineteenth century. Tapered wooden tube covered with black leather with a sling 32″ long closed, 41¾″ open. 1½″ objective with shade and sliding lens protector. Single brass draw marked "J. Sewill 61 South Castle Street Liverpool 30 Cornhill London maker to the Admiralty." M5974

345 English, nineteenth century. Tapered wooden tube 19½″ long closed, 31½″ open. 1⅜″ objective with sliding lens protector. Single brass draw marked "T. Harris & Son London." M2475

346 English, nineteenth century. Tapered wooden tube 20″ long closed, 33″ open. 1⅜″ objective with sliding lens protector. Single draw. Protector marked "Spencer Browning & Rust London." M3543

347 English, nineteenth century. Tapered wooden tube 26¾″ long closed, 42¼″ open. 1¾″ objective. Single draw marked "Spencer Browning & Rust London." M3710

348 Nationality unknown, nineteenth century. Tapered wooden tube covered with brown cloth 20″ long closed, 33½″ open. 1⅜″ objective with sliding lens protector. Single draw. Unmarked. M8555

349 English, nineteenth century. Parallel wooden tube covered with sail cloth painted white 21″ long closed, 34¾″ open. 1½″ ob-

jective with shade and sliding lens protector. Single brass draw marked "Spencer Browning & Rust London Day or Night." M2386

350 English, nineteenth century. Parallel mahogany tube covered with black leather 21″ long closed, 36½″ open. 1½″ objective with lens cap. Single draw marked "Spencer Browning & Rust London Day or Night." M6647

351 Nationality unknown, nineteenth century. Parallel wooden tube covered with brown leather 20¼″ long closed, 36¼″ open. 1¼″ objective with sliding lens protector. Single brass draw. Unmarked. M5981

352 Nationality unknown, nineteenth century. Parallel wooden tube covered with herringboning 20¼″ long closed, 35¼″ open. 1⅜″ objective with sliding lens protector. Single draw. Unmarked. M460

353 Nationality unknown, nineteenth century. Parallel maple tube 10″ long closed, 30″ open. 1⅝″ objective. Triple brass draw. Unmarked. Plate L M4087

354 English, nineteenth century. Parallel wooden tube 16¼″ long closed, 39½″ open. 1½″ objective with shade. Double brass draw marked "Spencer Browning & Rust London Day or Night." M3271

355 Nationality unknown, nineteenth century. Parallel wooden tube covered with black horsehair cloth 12½″ long closed, 17¾″ open. 1⅛″ objective. Single brass draw. Unmarked. M3070

356 Nationality unknown, nineteenth century. Parallel wooden tube 20½″ long closed, 36¼″ open. 1½″ objective with lens cap and shade. Single draw. Unmarked. M8338

357 Nationality unknown, nineteenth century. Parallel wooden tube 21″ long closed, 36″ open. 1½″ objective with sliding lens protector. Single brass draw. Unmarked. Plate L M1532

358 Nationality unknown, nineteenth century. Parallel maple tube 10⅝″ long closed, 17¾″ open. ⅝″ objective with sliding lens protector. Single draw. Unmarked. M956

359 Nationality unknown, nineteenth century. Parallel wooden tube covered with sail cloth 13¾″ long closed, 22½″ open. 1″ objective with sliding lens protector. Single draw. Unmarked. M2092

360 English, nineteenth century. Parallel wooden tube 20″ long closed, 35″ open. 1⅝″ objective. Single draw marked "Cox London Day or Night" and "Betsy of Baltimore." M7266

361 English, nineteenth century. Parallel wooden tube 24½″ long closed, 42¼″ open. 1½″ objective with shade and sliding lens protector. Single brass draw marked "Day or Night." M2387

362 English, nineteenth century. Parallel wooden tube covered with cloth painted brown 16″ long closed, 37″ open. 1¼″ objective with shade and sliding lens protector. Two brass draws marked "Frith London." M2385

363 English, nineteenth century. Parallel wooden tube 20″ long closed, 34⅜″ open. 1½″ objective with sliding lens protector. Single brass draw marked "Smith Bond St London Impd Day or Night." M2253

364 English, nineteenth century. Parallel wooden tube 14¾″ long closed, 30½″ open. 1½″ objective with shade. Double brass draw marked "Spencer Browning & Rust. London Day or Night." M3297

365 English, nineteenth century. Parallel wooden tube 14½″ long closed, 33¾″ open. 1½″ objective, cap missing. Double brass draw marked "Spencer Browning & Rust London Day or Night." M11183

366 English (?), nineteenth century. Parallel brass tube covered with brown leather 21″ long closed, 38″ open. 1½″ objective

with shade and sliding lens protector. Single brass draw. Unmarked. M3611

367 English (?), nineteenth century. Parallel brass tube covered with brown leather 19½″ long closed, 34″ open. 1½″ objective with sliding lens protector. Single draw. Unmarked. M2254

368 English (?), nineteenth century. Parallel brass tube covered with brown leather 19¼″ long closed, 33¼″ open. 1¼″ objective with shade. Single brass draw. Unmarked. M3267

369 English, nineteenth century. Parallel brass tube covered with brown leather 20¾″ long closed, 35¾″ open. 1½″ objective with sliding lens protector. Single draw. Unmarked. M955

370 French (?), late nineteenth century. Parallel brass tube covered with rosewood veneer 8¼″ long closed, 23¼″ open. 1⅜″ objective with lens cap. Three brass draws. Unmarked. M10501

371 American, c.1905. Parallel metal tube covered with woven blue braid and brown leather 27⅞″ long closed, 28⅜″ open. 2¼″ objective with lens shade and cap. Adjustable eye piece. Brown leather end caps and sling. M6648

E. Tide Calculators

372 English, c.1840. Paddle-shaped piece of oak 7⅞″ long over-all, 5″ diameter, ¼″ thick. Pasted on one side is a printed 32 point compass card marked "B. Wood Liverpool," a brass arrow-shaped pointer and a dial. M2702

372A English, 1795. "A New Universal and Perpetual Tide-Table. By Ralph Walker of Jamaica . . . Published 12th June 1795 by Robert Laurie and James S. Whittle, No. 53 Fleet Street, London." Engraved card 23⅝″ x 17″ with two volvelles, four shipping scenes, and a table of European and American port establishments, with mss. corrections and additions for a new edition. M11630

F. Computers

1. *Bones*

373 Napier's Bones. English, 1648. Two sets of boxwood rods $\frac{3}{16}$" x $\frac{3}{16}$" x 2", each marked with a series of numerals. One set is complete, the second lacks rods number 1 and 10.
Plate LI M2770

These rods, invented by John Napier (1550-1617) Baron Merchiston, when properly arranged will perform certain types of mathematical calculations. Contained in a pocket of Seth Partridge: *Rabdologia, or The Art of numbering by Rods* . . . London, 1648. This copy of the book is Partridge's own with manuscript corrections, and several manuscript poems in praise of the author.

2. *Gunter's Rules*

374 English, early eighteenth century. Boxwood 24" long.
M1858

375 English, early nineteenth century. Boxwood 24" long. Marked "T. Hemsley. Tower. Hill. London." Plate LI M5984

376 American, c. 1830. Boxwood 24" long. Marked "Belcher Brothers Makers New York." Plate LI M10130

377 English, nineteenth century. Beechwood 24" long. Marked "T. Wilson Maker London." Plate LI M2696

3. *Sectors*

378 English, c. 1800. Ivory, folding with brass rule joint, 6" long closed. Graduated in the English style. M6319

379 English, c. 1800. Brass gunner's calipers 22¾" long. Included is a sector in the French style. Marked "G. Adams Mathematical Instrument Maker to His Majesty. Fleet Street London." M2206

4. *Slide Rules*

380 English (?), c.1790. Boxwood 24″ long, single slide. Carefully divided on both sides with Gunter's divisions.

Plate LI M2383

381 American, c.1850. Birch 58¼″ long. With logarithm scales.

M3813

Said to have been made by Clement Littlefield, shipbuilder of Kennebunkport, Maine, and used for measuring and computing lumber.

5. *Miscellaneous*

382 Time-Distance-Speed Computer, and Pitch-Speed-RPM Computer. Coasting Computer and Cross Drift Detector. American, 1944. Two plastic discs 6″ diameter, each with a volvelle. Marked "American Hydromath Co. Copyright 1944." In pigskin case with instructions. M7924 a, b

383 Trim Computer. Capacity Computer. American, 1943. Two plastic discs 6″ diameter each with a volvelle. Marked "American Hydromath Co. Copyright 1943." In pigskin case with directions. M7923 a, b

384 Computer for Multiple-Expansion Engines. Scotch, c. 1890. Four part slide rule for designing engines. In slip case with directions signed "W. J. Goudie, Engineer . . . Glasgow."

M6975

385 Computer for power and speed for "Proposed Vessels on Measured Mile Trials." Scotch, 1894. Three part slide rule marked "Copyright 1894 A. M. Gordon." In slip case with directions. M6976

G. Barometers

1. *Mercurial*

386 Marine type, American (?), c. 1850. Ornately turned and carved mahogany column 39½″ long. Inlaid Fahrenheit ther-

mometer. Ivory-lined hood with double scales 27″ to 31″ and two verniers. Marked "Set 9 a.m. yesterday," and "Set 9 a.m. today." Mounted in polished brass gimbal ring and bracket.

Used on the clipper ship *Bald Eagle*. Plate LII M5023

387 Marine type, American, c.1850. Intricately shaped mahogany column 38″ long. Inlaid mercurial barometer with two ivory scales 26.7″ to 31″ and two verniers. Marked "10 am yesterday" and "10 am today." Inlaid Fahrenheit thermometer 10° to 130° fixed on a metal scale which also includes a small movable dial reading from 28 to 31. Marked "Improved Sympiesometer" mounted in brass gimbal rings and bracket.

Plate LII M6533

388 Marine type, English, c.1855. Brass tube 1″ diameter, 38″ long, upper end enclosed in glass tube. Scale reads from 26.5″ to 32.5″, with vernier. Marked "Adie London No 35." Fahrenheit thermometer on tube. Mounted in brass gimbal rings and bracket. Plate LIII M10485

This instrument was purchased by H. M. Meteorological Observatory in 1856. Its history in detail from then until it was sold about 1911 has been supplied by Mr. A. L. Maidens, Head of the Instrument Division of the M. O., through Mr. W. E. K. Middleton, Canadian National Research Council.

389 Marine type, American mid-nineteenth century. Rounded corner, square mahogany column 36¼″ long. Inlaid Fahrenheit thermometer in column. Ivory-lined hood, scale 27″ to 31″ with vernier, lower end brass. Scale stamped "Williamsburg, N. Y." Marked "G. E. Porter Boston." Gimbals and bracket missing.

M8987

390 Marine type, English, mid-nineteenth century. Ornately turned and carved mahogany column 38″ long. Inlaid Fahrenheit thermometer in column with ivory scale. Ivory-lined hood, scale 26.2″ to 31″ with vernier. Marked "James Bassnett Liverpool Maker." Brass gimbal rings and bracket.

Plate LIII M751

391 Office type, English, late eighteenth century. Mahogany and satinwood veneers, 38″ long. Hygrometer, Fahrenheit thermometer, mirror and spirit level inlaid on face with large wheel-type glazed dial for barometer reading from 28″ to 31″. Brass bezels and finial. M866

392 Office type, American, c.1850. Jigsawed black walnut backboard with exposed tube partially protected by wooden cover. Glazed hood with paper scale 25″ to 31″ marked "Standard." Fahrenheit thermometer reading from −40° to +140°. "The Storm King Barometer warranted correct and sold by C. Spooner Boston." M6108

393 Office type, English, mid-nineteenth century. Square mahogany column 37½″ long with inlaid Fahrenheit thermometer. Ivory-lined hood. Scale 26.7″ to 31″ with vernier. Marked "Spencer Browning & Co London." M4813

394 Office type, American, 1857. Mahogany box case 39″ long, 2¾″ wide. Enamelled scale 27″ to 31″, movable pointer hand. Marked "Timby's Patent Nov 3rd 1857." On reverse, printed label: "Manufactured by Alex. Marsh for the proprietors John M. Merrick & C. N. 7 Central Exchange, Worcester, Mass." M1723

395 Office type, American, c. 1870. Glazed oak case in Victorian Gothic style 45½″ x 8¼″, enclosing a glass U tube, a large printed paper scale "Admiral Fitzroy's Barometer" with two scales 26.5″ to 31″ with two movable pointers, one marked "Set 10 am yesterday," the other "Set 10 am today," with the Admiral's remarks on the rise and fall of the glass. Also enclosed is a mercury Fahrenheit thermometer from +10° to +120°, and a glass tube and scale marked "The Atmosphere" with comparisons of a mercury column and heighth in miles above the sea level. M6532

2. *Aneroid*

396 French, c.1850. Brass hanging case 5¾″ diameter. White dial 25″ to 32″, gold set hand, black indicator hand. Dial marked

"Halometallic Barometer Depose," works stamped "Brevete SGDG." M2981

397 French, c. 1851. Brass hanging case 5⅛″ diameter. White doughnut dial with a double scale in 20ths from 28.25 to 30.27. Gold set hand, black indicator hand. Dial marked "Metallic Barometer Gold Medal Exhibition 1849 E. Burdon and Richards Patent Paris" and "Universal Exhibition London 1851 Council Medal." Works stamped with monogram "EB[urdon]" and "R[ichards]." On the back of the case "Frazer" has been written in ink. In black sealskin carrying case.
Once the property of Robert Louis Stevenson. M9179

398 Scotch, c. 1860. Gold-plated case 1⅞″ diameter. White dial 24″ to 31″ by 20ths. Marked "J. Howiel Dundee." Rotating bezel with set pointer. In sealskin case. M2957

H. Thermometers

399 English, c. 1800. Mahogany box 5″ long, 1″ wide containing a mercury tube with 20° to 120° Fahrenheit and −8° to 50° Centigrade scales. M10534

400 English, c. 1800. Pine back with brass front, 10¾″ long mercury tube. Marked "W & S. Jones Holborn London." Fahrenheit scale −30° to +220° and Reaumur scale −27° to +85°. M2690

401 English, early nineteenth century. Boxwood back 8¾″ long, 1⅝″ high with horizontal Fahrenheit scale −60° to +110°. Marked "W. & S. Jones Holborn, London." Alcohol in tube.
Plate LIII M2592

402 English, early nineteenth century. Silvered brass back 9″ long. Fahrenheit scale −35° to +160°. Marked "Day." Mercury in tube. M2591

403 French, early nineteenth century. Folding boxwood case 13⅜″ long. Mercury tube. Case marked "Thermométre de Comparaison," "Paris 1820. 1838." Two carefully hand-divided scales Centigrade −20° to +120°, Reaumur −15° to +96°.
Plate LIII M4512

404 Russian, early nineteenth century. Mahogany hanging frame 12⅞″ long. Bronze scale with mercury tube. Engraved in Russian "Universal temperatures." Two scales Fahrenheit 0° to 230°, Reaumur −15° to +90°. Plate LIII M1724

405 American, c. 1850. Boxwood backboard 7¾″ long. Mercury tube. Fahrenheit scale −40° to +140°. Marked "Warranted Correct." On reverse in pencil "E. A. Silsbee Ship Columbia 1852/3 Ship Syren 1853/4." M806

E. A. Silsbee (1826-1900) was master of the ship *Columbia* and the clipper *Syren*. He joined the East India Marine Society in 1869.

406 English, c. 1870. Brass tube 10″ long, ⅝″ diameter, rubber lining containing glass mercury thermometer. Fahrenheit scale 0° to 150°. Marked "Casella London." M2617

407 Hygrometer, English, late nineteenth century. Oak box with shade sides and front, 13¼″ high, 7½″ wide, 4″ deep, containing a dry thermometer with Fahrenheit scale 0° to +135°, Centigrade scale −20° to +60°; a wet bulb thermometer with wick and glass reservoir, same scales, mercury in tubes. Scales marked "L. Casella London." M802

Box made by carpenter on the ship *Mindoro* of Salem.

I. Orreries

408 English, c. 1800. Manually operated wheelwork device with engraved paper pasted on 7½″ diameter wood base giving motion of the earth and its moon around the sun. Marked "A New Portable Orrery, Invented and Made by W. Jones and Sold by him in Holborn London." Equipped with small oil lamp and

tiny candle holder to replace the sun, thereby demonstrating eclipses and moon phases. The orrery is interchangeable with a "planetarium" which can be arranged to show the relative positions of the Sun, Mercury, Venus, Earth and its moon, Mars, Jupiter with its four moons, and Saturn with its ring and five moons in both the Ptolemaic and Copernican systems. In original box. Plate LIV M2929

409 English, c. 1812. Crank operated wheelwork device with engraved paper pasted on 12½" diameter wood table base, giving the motion of the Earth, its moon, Mercury and Venus around the Sun, demonstrating the Copernican system. The Sun and Earth are reversible to demonstrate the Ptolemaic system. Marked "Designed for the New Portable Orreries by W. Jones, and Made and Sold by W. & S Jones 30 Holborn London." With instruction book by William Jones *The Description and Use of a New Portable Orrery* . . . London, 1812. In original oak box. Plate LIV M10104

J. Planispheres

410 French, eighteenth century. Heavy pasteboard disc 17¼" diameter, with a disc 15⅞" diameter, covered with an engraved, water colored star map, revolving on an axis through Polaris, and over it a brass wire horizon circle and zenith. Marked "Planisphere Celeste Construit Suivant les Nouvelles Observations de l'Academie Royale des Sciences" "A Paris chez Delamarche, Geogr. Rue du Foin St. Jacques." M3582

411 Japanese, September 1796, designed by Tadasuke Fujita. Ten black lacquered wooden discs, the lower disc 14¾" diameter, the upper 6" diameter, mounted concentrically on a brass axle. The thumb screw on the axle represents the earth. The upper disc represents the moon and will show its phases; the second disc, the thirty days of a month; third disc, planet Mercury; fourth disc, Venus; fifth disc, Sun; sixth disc, Mars; seventh, Jupiter; eighth, Saturn; ninth, the twenty-eight Chinese stellar divisions

of the heavens; and tenth, the twelve points of the compass. Each planet is represented by a silver hemisphere, the Sun by a bronze hemisphere. All markings are in gold lacquered characters, except the stars grouped in the constellations which are depicted in blue with red name characters. On reverse are gold characters giving directions for setting up the instrument, the designers name and the date. Plates LV & LVI E16542

412 American, 1862. Cardboard disc 15¼″ diameter with black and white lithographed star map; a volvelle centered on Polaris enables the solution of many astronomical problems. Printed directions on the volvelle and the reverse of the disc titled "A Movable Planisphere of the Heavens at Every Minute, by Henry Whitall, 93 East 15th Street, New-York." Second Edition, 1862. M11193

413 American, 1871. As M11193 but titled "A Movable Planisphere of the Heavens at Every Minute, by Henry Whitall, Belvidere Seminary, Belvidere, N. J." Sixth edition improved, copyright 1871. M8917

V. Notes on Instrument Makers, Dealers and Designers

* From information given by Miss Susanna Fisher of the National Maritime Museum.

† From information supplied by Mr. E. W. Paget-Tomlinson of the Liverpool Public Museums.

ADAMS, GEORGE, born about 1704 was working on his own account by 1735 at "Tycho Brahe's Head," Raquet Court, Fleet Street, London. His was the first large instrument making business. He was appointed maker to George II and George III. He wrote extensively on instruments and published catalogues. He died in 1773 and was succeeded by his son George (born 1750) who published extensively and held Royal appointment. He died in 1795 and was followed by his son Dudley who moved to 60 Fleet Street in 1795, to 6 Jewry in 1800. The business ended about 1822.

ADIE, ALEXANDER, began in 1795 working for his uncle John Miller, 7 Parliament Close, Edinburgh. In 1806 Adie was admitted with the firm name Miller and Adie. Adie patented a form of barometer known as a "sympiesiometer" in 1818. By 1823 Adie was in business under his own name. Twelve years later his own son John joined the firm which became Alexander Adie & Son, continuing until 1881 when the name became Adie & Wedderburn.

ADIE, PATRICK, antecedents not known, was in business about 1850, certainly by 1855 when the London *Directory* shows he was at 395 Strand. Later he is listed with two establishments, 15 Pall Mall and 29 Regent Street. The 1870 *Directory* lists him as "Patentee of horse clipper." Even so, H. M. Meteorological Office returned one barometer to him six times between 1856 and 1911 for repair. The business continued until 1942.

AINSLEY. The firm of T. L. Ainsley was established in South Shields in 1846 and is still in business as T. L. Ainsley Ltd.*

ARNOLD, JOHN, born in 1734 in Cornwall and after serving a partial apprenticeship under his father, and after a lengthy visit in Holland, set up in business about 1760 in Devereux Court, London. In 1764 he made a watch for George III. One of his chronometers accompanied Cook in the *Resolution* and two others were carried by her consort, the *Adventure*. All three failed. After repair one of these accompanied the Phipps polar expedition and again failed. But in time

Arnold became the largest maker of commercial chronometers with a factory at Chigwell, Essex. He patented many of the parts now in use and is incorrectly said to have invented the name "chronometer" itself. About 1790 his son John Roger Arnold, trained in Paris under Breguet, joined him in partnership. The father died in 1799. The son was not his equal in workmanship or business ability and in 1830 took E. J. Dent (q.v.) as a partner. Arnold died in 1843 and the business passed to Charles Frodsham.

Baker, David. The name appears in all the New Bedford *Directories* from the first issue in 1836 to 1852. His advertising in the *Whalesmen's List* indicates that he was a dealer, not a maker of instruments.

Bamberg, Carl, born 12 July 1847 in Kranichfeld au dem Idem, and died in Berlin, Germany, 4 June 1892. He served an apprenticeship to Carl Zeiss at Jena 1862-66, and studied at the University of Jena 1867-68. In 1868 he moved to Berlin where he worked for the Sprenger Co., making mathematical and astronomical instruments. In 1869-70 he worked for Pistor and Martin; 1870-71 studied at the University of Berlin. In 1871 he organized his own firm which about 1921 became a part of the Askania Co.

Barraud. Barraud & Sons, Barraud & Lund, and Hilton Paul Barraud are listed in the London *Directories* from 1836 to 1870 as chronometer makers at 41 Cornhill.

Barry, Richard, was established between 1795 and 1799 as a stationer, chart and print seller at 209 Wapping Street. By 1805 he was working at 106 Minories as a stationer and mathematical instrument maker. Later he called his place "Stationer and Navigation Warehouse." By 1815 M. Barry was in charge and continued until about 1825.*

Basnett, James, first appears in the Liverpool *Directory* in 1829 as a clockmaker at 4 Barnes Court, Shaws Brow. In 1834 he gave his occupation as "optician" at 13 Roberts Street. At various numbers on Roberts Street until 1841 when the name spelling is changed to Bassnett at 1 Roberts Street. 1845 listed as "chronometer maker." 1855 the name became James Bassnett and Son. In 1865 the firm is listed as a compass adjuster for iron ships. In 1871 the name became Thomas Bassnett; 1894, Thomas Bassnett Ltd. Still in business as part of Chadburns.†

Bate, Robert Brettel, of London, was apprenticed in 1807. In 1822 he was at 17 Poultry Street, and in 1828-30 was master of the Spectacle Maker's Company. He was succeeded in business by J. D. Potter in 1840. One of his octant scales is marked with a foul anchor and capital "A".

BELCHER, T[homas] & W[illiam] & Co. Rule-makers, first appear in the New York City *Directory* at 141 Mulberry Street in 1825-26. Thomas alone is listed in the 1823 *Directory* as a "rulemaker." The title became Belcher Brothers at the same address in 1828-29. By 1834-35 they had moved to Burling Slip with Charles added to the firm; in 1839 the address was 17 Platt Street; 1844, 3 Platt Street; 1851, 221 Pearl Street. In 1860 the firm was composed of Henry, Joseph and Thomas H. Belcher at 233 Pearl Street with William running a hardware business at the same address. In 1864 William only was in business advertising "Rules and Hardware" at 94 Beckman Street, and in 1869 only hardware was sold.

BELLANI, SCHIAVELLI, of Brest, France. The only information available is the instrument presented in 1864.

BLACHFORD, ROBERT, began in 1801 taking over the business of his father-in-law J. Hamilton Moore, the author of *The New Practical Navigator*. Although Blachford sold instruments he was essentially a chart publisher; advertising he was "Chart seller to the Admiralty" at 116 Minories, London. In 1836 James Imray (q.v.) joined the firm, and a few years later the Blachford name disappeared.

BLAIR & SON. John Blair was an optician and instrument maker at 45 Prince Street, Bristol, England, from 1868 to 1872. From 1873 to 1875 the firm was known as John Blair & Son and from 1876 to 1888 as H. G. Blair.* An undated trade card in the Science Museum indicates a branch H. G. Blair & Co., in Cardiff, and states the firm was "from Bristol, established 1829."

BLEULER, JOHN, of London, circa 1757-1829, was apprenticed in 1771. His address in 1797 was 27 Ludgate Hill. The *Directory* spells his name BLEWLER and gives his occupation as "Optician." He was at the same address in 1826.

BLISS, JOHN & Co. In the 1840 New York *Directory* John Bliss and Frederick Creighton are found as watchmakers at 42 Fulton Street trading as Bliss & Creighton. Three years later an advertisement of James Munroe, 98 Union Street, New Bedford states that he is agent for Bliss' "American Chronometers equal to English." In 1845 they moved to 26 Burling Slip, New York, and the firm name became John Bliss & Co. In 1869 the company was at 66 South Street. About 1841 Bliss and Creighton began the annual publication of an *Abridgement of the Nautical Almanac and Tide Tables* which was continued through at least 1909. An advertisement in the 1872 issue shows the firm had purchased the preceding year the entire stock of Blunt & Co. (q.v.). In addition to chronometers and probably other instruments, Bliss made and patented the taffrail log in 1864 with various improvements patented in 1878.

BLUNT. E[DMUND] and G[EORGE] W[ILLIAM] Blunt were the sons of Edmund March Blunt (born Portsmouth, New Hampshire, 20 June 1770, died Sing Sing, New York, 4 January 1862), nautical book publisher. Edmund was born in Newburyport, Massachusetts in 1799, his brother in 1802. Following a disastrous fire in 1811 the father moved to New York City, where he re-established his business at 391 Broadway, and the next year an instrument store at 202 Water Street. George followed the sea until 1821 when he set up in the instrument business at 149 Fly-Market, New York. In 1824 Edmund joined as a partner under the name of E. & G. W. Blunt, 202 Water Street, New York. Other addresses of the firm were: 1826, 147 Maiden Lane; 1827, 123 Maiden Lane; 1837, 154 Water Street, and 179 Water Street where they remained until 1872. The firm was possibly the most progressive in the United States, thanks perhaps to George joining the U. S. Coast Survey as First Assistant in 1833. They were among the first to handle new developments in the trade. By 1833 they were American agents for the foremost English chronometer makers; about 1836 they had their own astronomical observatory in Brooklyn; in 1849 they were selling aneroid barometers "as good as mercury"; in 1853, Massey's patent logs and sounders, Ogden's and Ericson's sounders, and "new elastic center compasses"; in 1856 they completed a dividing engine on Edmund's design; in 1867 they were selling liquid compasses and marine binoculars. By 1850 they were publishing a nautical almanac and had agents in twenty East and Gulf coast cities. At that time, they were the American representatives for Edward J. Dent (q.v.) of London and were selling not only his chronometers and patent compasses, but also his dipleidoscope, " . . . a simple instrument for getting time by the Sun's passage." Edmund died in Brooklyn in 1866 and the next year George retired. The firm continued as Blunt and Nichols and later as Blunt & Co., but sold out to John Bliss & Co. 4 August 1871. George died in 1878.

BOLLES, WILLIAM, was born in either Great Barrington, Massachusetts or New London, Connecticut on 8 August 1800. There is no record that he received other than common schooling. After teaching school for several years, he took over the printing office of Samuel Green in New London and among other things published a speller, a widely used dictionary and an abolitionist newspaper. In 1825 Silliman's *American Journal of Science*, IX, published a note on Bolles' trigonometer with an engraved plate of the instrument. Silliman wrote the device would be considered " . . . valuable by . . . seamen in all cases in which expedition is required without much numerical accuracy." Bolles himself had the year before published *A description and practical application of Bolles' trigonometer*. He died near New London in 1867.

DE BORDA, JEAN-CHARLES (1733-1799). French naval officer and mathematician. In 1772 designed the circle of reflection, which he described in his book *Description et Usage de Circle de Reflexion*, Paris, 1787.

BORGER, IVER JENSEN. Captain Carl V. Sølver, the well-known expert on Danish maritime history has kindly provided the following information through Captain F. Holm-Petersen, Director of Sjøfartsmuseet, Troense, Denmark:

"Iver Jensen Borger, sail-, flag- and compassmaker, served his apprenticeship with the sail- and sandglass maker Peter Thomasen in Sønderborg. Later he served for several years as sailmaker in deep water and in 1754 he was discharged from H. M. S. *Nellebladet* [The Nettle Leaf], fifty guns, after a three years' cruise in Indian waters, as sail- and compassmaker. He now intended to leave the sea and settle down in Copenhagen with his own shop. However, the Sail-, Flag, and Compassmakers Guild would not admit him within their ranks until he had passed the rather stiff examination and had proved an eight years' apprenticeship. This he was not able to do and therefore the Guild point-blank refused his application. After various vain attempts he at last applied to the king, Frederik V, recommended by influential friends in the Royal Navy, and by a royal order, dated 17th March 1755 the Guild was commanded to admit Borger for the examination without delay.

"Borger now had to prove his ability by making a series of masterpieces according to the rules of the Guild, namely: One sloopsail, one topsail, one spanker, one Royal flag and pennant, one English Ensign and pennant, two Azimuth compass cards with needles, two Marine bearing compasses with cards and sights and cardan rings, one binnacle compass, one four-hour sandglass, one two-hour glass, two half-hour glasses, one ten-minute glass and one five-minute glass, etc. Naturally, the examiners being members of the Guild, made all sorts of obstructions for Borger passing the test, but at long last, having the Royal command in mind, the candidate was passed as a master of the Guild.

"This happened on the 21st November 1755 and three days later, on the 24th November, Borger opened his business at his house near one of the canals at Christianshaven in Copenhagen.

"The very first compass card printed by Iver Jensen Borger was embellished with a representation of his last ship *Nellebladet*, and the same picture is used as a registered trademark by the present firm Iver C. Weilbach & Co.

"The next decades were very satisfactory to Borger's newly started business, and aided by his friends in the Royal Navy he soon became a recognized member of the Guild with apprentices and skilled men in his service. One of his apprentices, J. P. Weilbach, made himself indispensable, married the master's daughter and later, in 1799, took over the whole business on his own account."

The business founded by Borger in 1755 continues today under the name of "Iver C. Weilbach & Co." Their 1799 shop sign is in the Copenhagen By Museum.

BOWDITCH, NATHANIEL, born Salem, Massachusetts, 26 March 1773, died Boston, 16 March 1838, self-educated mathematician, master mariner, author of *The New American Practical Navigator;* translator of La Place; member East India Marine Society and its Inspector of Log Books; Salem Marine Society, and

many American and foreign learned organizations. A quadrant in this collection is the only instrument known to have been made by him.

Bracker, George, was at 19 King Street, Commercial Road, London, from 1826 to 1836.

Bradford, George, was located at 99 Minories, London, from 1826 to 1836.

Brandis & Sons, Brooklyn, New York, was the outgrowth of a business founded in 1872 in New York by Frederick Ernest Brandis (born Hildesheim, Germany, 1845, died 1916 Brooklyn). The sons, William (b. 1868, d. 1936) and Henry (b. 1866, d. 1959), continued the business to 1922 when it was sold to Pioneer Instrument Company. In 1938 the name and business were purchased by Richard D. Leaf who continues the business under the name of Brandis & Sons, Inc.

Brockbanks. John Brockbank was apprenticed as a clockmaker in 1761 and was admitted to the Clockmaker's Company in 1769. Myles Brockbank, a nephew (?) was aprenticed to John in 1769 and became a member of the Company in 1776. The two in partnership as Brockbanks, 6 Cowper Court, Cornhill, were eminent chronometer makers. John died just about 1800 and Myles retired in 1808. They were succeeded by another John and Myles, nephews of the first Myles, as John Brockbank & Co.

Brown, E[dmund] & Son. In 1823-24 in Harman Street, New York; at 54 Cherry Street in 1825-26 as "E. Brown Mathematical Instrument Maker." In 1829-30 at 14 Hamilton Street; 1835 at 27 Fulton Slip; in 1840-41 the son Bush G. Brown joined the firm at the same address; in 1860 the name became "E. Brown's Son"; out of business by 1869. Edmund had been an apprentice of Richard Patten (q.v.).

Browne, B., a Bristol, England, instrument maker, was located at The Quay from 1797 to 1831.

Browning see Spencer Browning & Rust.

Brunson Instrument Co. was organized in 1927 at Kansas City, Missouri, by A. N. Brunson as the instrument repair shop of the Gallip Map Co. In 1939 the company was separately established to make surveyors' instruments. Incorporated in 1946 and still in business.

Callaghan, William, of London, "practical optician" is listed 1868-70 at 23A New Bond Street, W.

CALLENDER—is probably Joseph (1751-1821), a Boston engraver, pupil of Paul Revere and die-sinker at the Massachusetts mint. Probably he, like Wightman, produced a "stock" compass card.

CAMERON, J. R., was in business at 54 South Castle Street, Liverpool, in 1852.

CASELLA, LOUIS PASCHAL, of London is listed in the *Directories* 1855-70 as a "wholesale optician" and maker of all types of scientific instruments for the Admiralty, Board of Trade, Ordnance, East India Company, American and Russian Governments at 23 Hatton Gardens, E. C. and in 1875 at 147 Holborn Bars, E. C.

CHAPMAN, JAMES, "At the Hadley's Quadrant opposite the King's Store House, St. Catherine's London," was in business circa 1760. His trade card in English, French and Dutch indicates he sold every type of nautical instrument. Sextants dated 1775 and 1788 and octants dated 1788 and 1794 exist. The 1775 sextant has both the full name and "J C" engraved on the arm. He is not listed in the 1797 *Directory*.

CHELSEA CLOCK CO., Chelsea, Massachusetts, began business in 1897 and still continues under the same name.

COX. William Cox was an optical instrument maker at 3 Barbican, London, in 1786. By 1790 Joseph Cox had taken over and in 1825 moved to 5 Barbican. James Cox in 1838 succeeded and between 1853 and 1855 George Cox was the head.*

CUTTS, I. P., SUTTON AND SONS of Sheffield, advertised that the firm was established in 1804 and in 1875 stated they made all types of optical instruments, sextants, compasses, aneroid barometers and held an appointment to Her Majesty as optician. The name has had many combinations.

DAVENPORT, WILLIAM, apparently born in Philadelphia on 20 November 1778, was apprenticed to an instrument maker, William Dean. In 1802-04 he was listed in the Philadelphia *Directory* carrying on Dean's business at 43 South Front Street; 1805-14 at 45 South Front and 1816-29 at 25 South Front Street. He died 19 May 1829. His sons S. and J. M. continued the business until 1838 as "William Davenport, Sign of the Quadrant."

DELLA TORRE & CO. Established at St. John, New Brunswick, Canada, in 1835 by an Italian, Della Torre, as a "fancy goods" general store. Succeeded by his brother J. Della Torre of London, and in turn by his brothers Charles and William. Branch in Halifax. Dealers only; never makers.

DELURE. Working in Paris about 1720, apparently making all types of instruments.

DENT, EDWARD JOHN, of London was born in 1790. After a modest success as a watchmaker, in 1830 he formed a partnership with John R. Arnold (q.v.) as Arnold and Dent, 84 Strand. This lasted ten years. Thereafter Dent worked alone at 82 Strand and later at 61 Strand. He died in 1853. In 1850 he patented a compass used by the Royal Navy; invented a chronograph; a form of pendulum; and made many improvements in clockwork. E. & G. W. Blunt were his agents in New York and in an advertisement of 1850 offered Dent's compass, chronometers and his "Dipleidoscope, a simple instrument for getting time by the Sun's passage." After his death the firm of E. Dent & Co. continued in the Strand and at 34 Royal Exchange. In 1868-70 the firm held appointments to the Queen, Prince of Wales, and later to several European navies. The firm was still in business in the 1890's.

DIRIGO. Established 1907 at Lexington, Massachusetts by Eugene M. Sherman, a native of Maine, making mariners' compasses only. Moved to Bellingham, later to Bellevue, Washington. In 1942 the Dirigo Compass and Instrument Cooperative Association was organized in Auburn, Washington, and still continues in business in Seattle.

DOBBIE, ALEXANDER, first entered in the Glasgow *Directories* as a "chronometer and watch maker, chart dealer and instrument maker" in 1842. Became Alexander Dobbie and Son Ltd. in 1886 and still exists as Dobbie McInnes Ltd., 191 Broomloan Road.*

DOLLOND. John Dollond was born in London in 1706, the son of a Huguenot silk weaver. John followed his father as a weaver, but after studying Greek, Latin and mathematics, about 1752 joined his own son in an optical business. In 1757 he patented the achromatic lens and began to make them commercially. In 1761 he was elected to the Royal Society and was appointed Royal Optician. He died the same year. The son Peter continued the business. His first address, 1750, was Vine Street, Spitalfields. When the father joined in 1752 they moved to the "Golden Spectacles and Sea Quadrant," Exeter Change, Strand. After the father's death Peter took a partner but soon bought him out. In 1766, he moved to 59 St. Paul's Churchyard, and in 1791 to 35 Haymarket. He is said to have invented the back sight device for the Hadley quadrant. He was a member of the American Philosophical Society and Master of the Spectacle Makers Company. He retired at 87 and died in 1820, leaving the business to his nephew, George Huggins, who changed his name to George Dollond. The name still continues in business.

Dring and Fage of London were in business by 1797 as hydrometer makers at 21 Gracechurch Street, by 1826 at 20 Tooley Street. The 1868-75 *Directories* give them as hydrometer, saccharimeter and guaging instrument makers to Her Majesty's Customs at 19 and 20 Tooley Street, S. E. One of their octant scales is stamped with a foul anchor and the capital letters "D" and "F".

Dumotiez, Louis Joseph (born 1757, died ?) and his brother Pierre Francois began as instrument makers in Paris about 1780. In 1784 the address was Rue du Jarninet. He was succeeded by his nephew Nicolas Constant Pixii-Dumotiez (q.v.).

Dupee, John (IV), was born in Boston in 1729, the son of John Dupee (I) a French Huguenot who had appeared in Boston before 1704-5. John (I) had three sons named John (two of them died in infancy), the third was the maker of the octant owned by the Museum dated 1755. The date of his death has not been found.

Duren, H[enry], first appears in the New York *Directory* in 1860 as a machinist at 39 Burling Slip. The next year he is listed as a nautical instrument dealer; in 1864 as a chronometer dealer; in 1865 as a clock dealer and in 1869 as a chronometer dealer all at the original address.

Eggert, Dominick, appears in the New York City *Directories* 1834 as watchmaker; 1841-42 as Dominick, 239 Pearl Street without profession; 1848-50 as D. Eggert & Son, chronometers; 1850-51 with Charles, John and Dominick associated. In 1869-70 Dominick B. and John were trading as D. Eggert's Sons at 127 Pearl Street. The firm was not followed further.

Emery, Samuel, was born in Newbury, Massachusetts, 15 January 1787. He had moved to Salem by 1808 and was in business at 12 Water Street the next year. In 1864 he moved his business to 162 Derby Street and four years later retired. He died without issue 24 March 1882, leaving the greater part of his estate to his wife's sister's son, John Kehew (q.v.). Emery was Salem's foremost instrument dealer but except for compasses it is believed he made no instruments, although he sold all kinds.

Fayrer, J. [James and John], of London, is said to have done the dividing of Troughton's (q.v.) instruments. In the 1826-70 *Directories* the address is 66 White Lion Street, Pentonville, and the occupation "mathematical instrument makers."

Fitton, Francis, was working in partnership with Alexander Fitton at 36 Gratton Street, Cork, Ireland, in 1784-86.

FITZROY, ROBERT (1805-1865), vice-admiral, Royal Navy; commanded H.M.S. *Beagle* on the "Darwin" expedition. Chief, Meteorological Department of the Admiralty. Designer of a mercurial barometer. Set up the British storm warning and weather forecasting system.

FLETCHER. 48 Lombard Street, London, was the agent for Fordsham & Keen, Liverpool, chronometer makers. A John Fletcher & Sons are listed as chronometer makers in Lombard Street in 1855 and at 148 Leadenhall Street, E. C., 1868-70.

FORTIN, NICHOLAS. (Born 1750, died 1831). French instrument maker. About 1800 invented the cistern for marine mercurial barometers and a repeating circle.

FRENCH OF LONDON. An advertisement in the 1833 edition of Bowditch's *American Practical Navigator* shows that E. & G. W. Blunt of New York sold chronometers made by James M. French. From 1808 to 1838 he was active at 15 Sweetings Alley and from 1839 to 1842 at 18 Cornhill.*

FRITH OF LONDON at 8 Cursitor Street in 1826. The 1868-70 *Directories* list Peter Frith & Co., 5 Bartlett's Buildings, Holborn, Joseph Stayner Eidmans, agent, as telescope makers. An advertisement in 1875 states that Peter Frith & Co., was established in 1790 in Sheffield and that they made all types of optical goods.

FRODSHAM. The London *Directory* of 1797 lists William Frodsham & Son, Kingsgate Street, as watch and clock makers. William, the son, was a Fellow of the Royal Society and master of the Clockmaker's Company 1836-37 and died in 1850. His father had been a pupil of Earnshaw and his mother a granddaughter of John Harrison. In 1801 William Parkinson joined the firm and the name was changed to Parkinson & Frodsham, 4 Change Alley. They were chronometer makers to the Admiralty and to the East India Company. Their advertisements appear as late as 1875. Henry Parkinson, William's son, moved to Liverpool and opened a branch there. Later the branch changed its name to Frodsham and Keen, 17 Castle Street and Salthouse Dock, Liverpool, and seems to have become independent as it had an agent, Fletcher at 48 Lombard Street, London.

FUJITA, TADASUKI. A famous Japanese mathematician, born 1734, died 1807.

GALE, JAMES, baptised in Salem 24 April 1791, made instruments in Salem at Neptune and Water Streets by 1815. He was still there in 1819 but moved in

1824 to Haverhill, Massachusetts, where he became a book dealer and banker. He died in 1871.

GARDNER. First entered in the Glasgow, Scotland *Directory* in 1787 as "John Gardner, mathematical instrument maker." Remained in the *Directory* with slight variations of name until 1920. The firm claimed to have been established in 1765. A chronometer marked "Gardner & Co. Dublin" is owned by the National Maritime Museum.*

GILBERT, JOHN, of London, was evidently one of the largest producers of instruments during the last half of the eighteenth century. He is listed in the London *Directories* from 1763 through 1797, but existing instruments are dated 1755, 1758, and 1767 and one as early as 1730. His known addresses were Tower Hill, 1763; 23 St. Paul's Churchyard, 1776; at "The Mariner," Postern Row, Tower Hill, after 1791. According to the Science Museum, he died in 1801 and was succeeded by a son and grandson both named William who had been apprenticed to their fathers in 1794 and 1813.

GLOVER, HENRY, according to his label had been apprenticed to Parkinson & Frodsham (q.v.) was foreman at Roskell & Sons, and superintendent at Arnold & Dent (q.v.). He appeared in New York 1842-43 at 33 John Street. Thereafter until 1870 he moved so often he must have had little time for work. Each listing is "chronometers" until 1862 when "charts" are given and 1863 "nautical instruments" and 1869 "optician." 1843-44, 29 Lewis Street; 1845, 192 Broadway; 1846, 119 Broadway; 1847, 5 Wall Street; 1848, 115 Wall Street; 1850-53, 119 Wall Street; 1853, 58 South Street; 1854, 154 South Street; 1860-62, 107 South Street; 1864, 104 South Street; 1866, 20 Burling Slip; and 1868-70, 222 Water Street.

GOULD, CHESTER, opened a shop in Philadelphia at 47 Walnut Street in 1794, describing himself as "from London" in a newspaper advertisement. From 1796-98 he was at 70 South Front Street at the "Sign of the Quadrant." In May 1800 he patented in London a "Log for ascertaining a ship's distance at Sea." He then claimed Rome, New York, as his home. The next year he patented in London an improved model of the log and gave his address as "late of Rome, New York, now of Red Lion Street, Clerkenwell, merchant." In 1803 he patented in England No. 2706 "a nautical time piece." A Horace Gould offered a recording log for approval to the Boston Marine Society in 1801.

GOWLAND, GEORGE, 76 South Castle Street, Liverpool. Aside from the sextant used by Dr. Livingstone nothing is known of this man's work except an artificial horizon at the Sjøfartsmuseum, Stockholm, Sweden, marked with his name, address and the words "Inventor & Patentee."

Gray & Lissett of Liverpool. Nothing concerning this firm has been found. Probably it existed in the late eighteenth century. A John Gray made instruments at 10 East Side Dry Dock, Liverpool, from 1805 to 1821. A firm of Jones, Gray & Keen was in business in 1845; Gray & Keen at 25 Strand, Liverpool, from 1847 to 1851. John Gray alone from 1854 to 1861 and Robert Keen alone in 1854.†

Greenough, Thomas, Sr., was born in Boston, 6 May 1710 and died there 16 August 1785. He came of a family of Boston maritime tradesmen: his father was John Greenough, a shipwright; his brother Newman, a sailmaker; his son, Thomas Jr., an instrument maker. From the quantity of silver bequeathed his children and grandchildren, and from the extent of his real estate transactions he must have had a lucrative business. His son Thomas, Jr., born Boston 1738, died Westford, Massachusetts, 11 August 1775, was also an instrument maker in Boston.

Hagger, Benjamin King, born 1769, began business in Boston certainly by 1789, possibly by 1784, but he is not independently listed in the Boston *Directory*. He is included as a partner to his father, William G. Hagger (q.v.), mathematical instrument maker and ship chandler. In 1816 he moved to Baltimore, Maryland, where he began business under his own name at 57 South Street, and 72 Baltimore Street. He died 8 November 1834 and his son John W. Hagger took over the business at both addresses, "at the Sign of Dr. Franklin." Later the firm became Hagger & Brother, with C. E. E. Hagger and C. H. Lange in partnership. The address then was Pratt Street and Spears Wharf, upstairs, Baltimore. It is believed Benjamin may have worked in New York before moving to Baltimore.

Hagger [Haggar, Hagar] William G., was born in Newport, Rhode Island, in 1748. He was connected by marriage with Benjamin King (q.v.), mathematical instrument maker of Newport, formerly of Salem. He was in business in Newport by 1766, but in the 1789 Boston *Directory*, Haggar is listed as an instrument maker "near the Draw Bridge, Ann St." and in 1795 under the name of "Haggar and Son," mathematical instrument makers and ship chandlers, "Two Doors south of the Draw Bridge" advertised "Hadley's and Davis's Quadrants, Surveying Instruments, Guaging do. pocket cases of Instruments, Gunters scales and Dividers, Rules of all sorts, Azimuth Compasses, Amplitude do, Brass steering do, Wood do, Brass Cabin do, pocket compasses, prospective [sic] Glasses." He died in Boston 23 January 1832, aged 82, but is not listed as an instrument maker in the 1800 *Directory* when he was living with his son, Benjamin King Hagger (q.v.), at the address in Ann Street.

Halsey, James [I], first appears in Boston records in 1669/70. The Davis quadrant signed by him and dated 1676 in this collection is the first now known

instrument made in the English North American Colonies. He died in Boston in 1696.

HALSEY, JAMES [II], probably a nephew of James [I], was born in Boston in 1695, the son of Nathaniel and Hannah Halsey. He died in 1767. His will states he is a mathematical instrument maker and disposes of his tools, "lodestone," "stock of boxwood," etc.

HALSEY, JOSEPH [I], son of William and Sarah Halsey of Boston, was born 1657 and died 1745. His inventory shows "6 dozen Compass boxes," and tools, bequeathed to his son Joseph [II].

HALSEY, JOSEPH [II], son of Joseph [I] and Elizabeth, was born in 1699 and followed his father's trade as instrument maker in Boston.

HARDY, J. & I. The only instrument maker located is John a watchmaker, 8 Bridgewater Square, London. He is listed in the 1797 *Directory*.

HARRIS, T. & SON, London. Thomas Harris took over the business of Thomas Blunt in 1823. As late as 1875 the firm was advertising that it made opera and race glasses and telescopes at 52 Great Russell Street. In 1826 they were globe makers to H. M. the King. They claimed they were established in 1780 in an advertisement printed in 1880.

HARRIS, W[ILLIAM] & CO., were in business at 50 High Holborn, London, in 1826.

HEATH & CO., LTD. 2 Tower Royal, Cannon Street, London, state in a 1910 catalog at the Peabody Museum that the firm was established in 1845. It is still in business using the trade mark "Hezzanith."

HELMSLEY, T[HOMAS]. Joshua and Thomas Helmsley were in business at 11 King, Little Tower Hill in 1826; Thomas alone, same address in 1836; and Thomas & Son thereafter.

HENSHAW, WALTER (fl. 1667-95), admitted to Clockmaker's Company in 1667; became master in 1695. Worked "at the Sign of the Globe," East Smithfield, near the Hermitage, Wapping, London.

HOLLIWELL, WILLIAM, moved from London to Liverpool and is first listed there as William Holwell, mathematical instrument maker at 5 Bromfield Street. Became William Holliwell & Son in 1829; in 1849 Holliwell Bros. and disappeared after 1862. They had many changes of address.†

HOLM, PIETER, a Swedish sailor who lived in Amsterdam, Netherlands, conducted a navigation school called the *Ship Recht door Zee* and a chart and instrument business. He died an old man in 1776.

HOOKER, WILLIAM, in 1803-4 appears in Philadelphia as an engraver; 1805-11 in Newburyport, Massachusetts, where he married the daughter of E. M. Blunt. 1811 moved to New York City and opened an instrument shop at 202 Water Street. In 1824 his billhead reads "Instrument Maker & Chart Seller to the U. S. Navy and Agent for the Nautical Store [E. & G. W. Blunt] 202 Water Street, New York." He died about 1846.

HOWIE. A James Howie, 76 Nethergate, Dundee, Scotland, maker of chemical, philosophical, optical and mathematical instruments, is entered in the *Directory* for 1869-70.*

HUGHES, JOSEPH, was in business in Limehouse in the early nineteenth century. He was succeeded by his son, Joseph, who moved to Ratcliffe Cross in 1835, later to Minories, and in the 1868-75 *Directories* is listed as a wholesale nautical and optical instrument maker, Bickley Row, Rotherhithe and at 38 and 40 Queen Street, Ratcliffe. His younger brother, Henry, was in business in Commercial Road in 1835, later (1840) moving to 120 Fenchurch Street, then to number 59. The firm is still in business as H. Hughes & Son, Ltd., using the trade name "Husun." One Hughes octant scale is marked with an anchor without a stock or ring.

HUTCHINSON, CHARLES C. See LINCOLN, FREDRICK W.

HYDE, J. M., of 1 Broad Quay, Bristol, England, is entered in the *Directory* as a mathematical instrument maker in 1841-52.*

IMRAY, SON & CO., had its origin in the nautical publishing and navigation teaching business of J. Hamilton Moore. His son-in-law Robert Blachford (q.v.) took over the Moore business in 1801 and James Imray joined with him in 1836, at 102 Minories, advertising as a "Chart publisher and manufacturer of nautical Instruments." In 1899 Imray merged with Norie & Wilson (q.v.).

JAYNE, JOHN, born in Marblehead, Massachusetts, in 1784, began business in Essex Street, Salem, in 1805 "at the Sign of the Hadley's Quadrant." He moved his shop to Water Street in 1807 and to Derby Street opposite Union Wharf in 1811. He died in 1813 in Marblehead. His first advertisement shows the stock he carried: "Sextants, Quadrants with and without Tangent Screws warranted good, Telescopes (Achromatic, day and night) . . . Common Spy Glasses, Cases of Mathematical Instruments . . . Gunter's Scales, Dividers, Protractors, Time & Log Glasses, Pocket Compasses," and that he made

"Azimuth, Amplitude, Brass and Common Compasses." Later ads include "Metal and Black Ebony Sextants" and "London made Azimuth Compasses Elegant Metal Sextants with Silver Arches . . ." "Semi-Circles, Circumsentors [sic], Guaging Rods, Board and Timber Rules . . ." The Essex Institute owns a rule dated 1805 and two rods dated 1806.

JONES & RUST. The first *Directory* entry for the firm is in 1811 "Navigation and stationary warehouse 29 Pool Lane, Liverpool." In 1813 at 31 Pool Lane and last entry under the name of Joseph Rust at 28 Pool Lane in 1816.†

JONES, THOMAS. One man of this name, the son of David, was born 1775 and was working for Ramsden in London at the age of 14. At an unknown date, he went into business for himself, became an F.R.S. and an organizer of the Astronomical Society. His addresses were Holborn, 62 Charing Cross, Rupert Street, and Cockspur Street, all London. He died in 1852. Another of the same name advertised in the 1821 edition of Bowditch's *American Practical Navigator*, from the Minories, London; 4 Harrington Street, Castle Street, near the Exchange, Liverpool: "Agent for Parkinson & Frodsham's London Chronometers . . . Compasses, Quadrants, Sextants & C repaired. The Modern Improvements applied to them occasionally." Nothing more is known of him. One of his octants is marked with a foul anchor.

JONES, WILLIAM and SAMUEL, were the sons of John Jones, instrument maker and joined with him as John Jones & Sons at 135 Holborn, London. By 1793 the sons alone are in business under their own names at 30 Lower Holborn. Their catalogs dated 1801, 1831, 1836, 1843 and 1855 are in the Peabody Museum Library.

KEHEW, JOHN, appears as a maker and dealer in the New Bedford, Massachusetts, *Directories* from 1841 to 1856 at 69 North Water Street; in 1859 at 49 North Water Street. His last advertisement appears in 14 January 1862. Soon after he joined Edward S. Ritchie (q.v.) in Boston. He was born in Amherst, New Hampshire, 30 April 1818, and probably learned his trade from his uncle, Samuel Emery (q.v.) of Salem, to whom he sold half a house in Curtis Street, Salem, for $950 in 1839, possibly the capital he used to set up in business in New Bedford the same year. Kehew was Emery's executor and residuary legatee in 1882. He died in Boston, 27 February 1889.

KELLEY & SON. James S. is listed in all New Bedford, Massachusetts, *Directories* from 1884 through 1895.

KELVIN & WILFRID O. WHITE CO. Organized in Boston in 1919 by Wilfrid O. White, born 1878 in Australia, who in 1900-01 had studied under Lord Kelvin in Glasgow, Scotland, and who had settled in Boston in 1902. There

he worked for the instrument dealer C. C. Hutchinson (q.v.) until 1907 when White began working under his own name as a professional compass adjustor. During World War I, he manufactured compasses and in 1919 organized the firm with a branch in New York City. In 1929 he designed the spherical compass and in 1947 the "Constellation" compass. In 1950 the English interest in the firm was purchased and the name became Wilfrid O. White & Sons, Inc. White died 12 August 1955. At various times there were branches in New York, Baltimore, Los Angeles and Montreal. The firm became part of the Danforth Anchor Co. in 1962. Through marriage, the *Eldridge Tide and Current Tables* came to the firm and have been published annually by it or its successor, Robert Eldridge White Instruments, Inc., Boston.

KEOHAN OF LONDON. A Thomas is listed as an instrument maker at 2 Arbour Terrace, Commercial Road and at 33 Upper East Smithfield in the *Directories* from 1863 through 1870.

KEUFFEL & ESSER. Founded as a partnership in 1867 at 79 Nassau Street, New York, by Wilhelm Keuffel and Hermann Esser to import and sell drafting instruments. Subsequent addresses were 1868, 71 Nassau Street; 1870, 116 Fulton Street; 1874, 119 Fulton Street; 1878, 127 Fulton Street. Incorporated in 1889, the Company now has many branches and factories. In 1870 began to manufacture drawing instruments; in 1885 surveying instruments; about 1890 sextants and in 1891 the first slide rules manufactured in the United States. Trade marks, a griffin since 1871, "Paragon" on instruments after 1901, today "K&E."

KING, BENJAMIN, son of Daniel King of Salem (1704-1790) (q.v.), "Mathematical Instrument Maker," was baptised in Salem 23 November 1740. His father's brother Benjamin, who was born in Salem, moved to Newport, Rhode Island, where he also became an instrument maker. Benjamin who was working by 1740 had a shop in Court Street and later, one in Lynde Street, Salem. He died 26 December 1804. The Rev. William Bentley wrote of him: "He was a Mathematical Instrument maker, in that branch which immediately regarded practical navigation by Quadrant and compass. He supported a very good character through life and was much esteemed." King's son-in-law, Captain Jonathan Mason, succeeded to the business until his own death in 1808.

KING, BENJAMIN, of Newport, Rhode Island, the son of Captain Samuel King of Salem, was baptised in Salem 13 March 1707. He had moved to Newport and married Mary Hagger in July 1742. In 1759-60, member of the firm of King & Hagger. He died in 1786 and was followed in business by his son Samuel.

KING, C[HARLES] G[EDNEY], born in Boston, 16 March 1808. Apprenticed to his father, Gedney [II] (q.v.). Took over the business on his father's death, 1839, at 7 Broad Street. Remained there until 1858 when he moved to 72 Washington Street. Died 25 September 1858.

KING, DANIEL, of Salem, was baptised 19 November 1704. He was the son of Captain Samuel King; the father of Benjamin King of Salem; the uncle of Benjamin King of Newport; and great uncle of Gedney King [I] of Salem. He died 27 June 1790 having been a mathematical instrument maker in Salem all his working life.

KING, GEDNEY, son of Gedney King [I] (1740-1814), was born in Salem 31 August 1777. He was apprenticed to his uncle Benjamin of Salem. By 1800, he was an instrument maker first in Fore Street, later in Fish Street, Boston; 1805, 10 North Row, Fish Street; 1820, 29 State Street; 1826, 113 State Street; 1827, 118 State Street; 1831, 7 Broad Street. In 1832-39, the firm name became Gedney King & Son at 7 Broad Street, Boston. The son was Charles G. King (q.v.). Gedney King died 18 July 1839.

LAMB, ANTHONY, born London about 1703, was apprenticed to Henry Carter, instrument maker near St. Clement's Church, London. In July 1724, he was apprehended as an accomplice of the notorious Jack Sheppard. Sheppard was hung at Tyburn, but Lamb was transported to Virginia. There he served his time, then moved to New York City, where he returned to his respectable trade. He was admitted a freeman of the City in 1731, married and became one of the foremost instrument makers. Lamb apparently was one of the first in America to make what he advertised in 1749 as ". . . the lately invented and most Curious instrument called the Octant for taking the Altitude. . . ." His son John (1735-1800) worked with his father until 1760. John became a General in the Continental army, and after the War, Collector of Customs at New York City. The father's business was ruined when the British took New York and again when they raided New Haven, to which Lamb had fled. After the War, he returned to New York where he died 11 December 1784.

LAMBERT, H. T., is found in the London *Directory* the first time in 1853 as Henry Thomas Lambert sailmaker and chandler at 307 Wapping High Street. By 1858 he was working at 1 America Square and 1 John Street, Minories. Later he acquired 341 Wapping High Street. He disappears from the *Directory* in 1868.*

LEAVITT, WILLIAM, was born 3 April 1801 in Salem, Massachusetts. By 1837 he was teaching in a Salem boys' school. During the Mexican War he served in the Navy and after 1849 conducted a school of navigation in Salem until his

death in 1883. At one time his school was on a part of the property now owned by the Peabody Museum. He had a good knowledge of Latin, ancient Greek and Hebrew; was the author of several works on finding longitude and lunar observations, and appears to have been the inventor of the string course protractor.

LEKEUX, RICHARD, was at 137 High Street, Wapping, near Execution Dock, London, in 1826. An octant dated 1784 is held by the Museo Navale, Madrid. Another by him has "RL" engraved on the arm just above the vernier.

LILLEY. Originally founded by John Lilley in 1812. From 1826 to 1863 as John Lilley & Son at 7 Jamaica Terrace, Commercial Road, Limehouse, London, and at 9 London Street, Fenchurch Street from 1868 to 1875. After 1880 it merged with a firm organized by William Reynolds in 1827 as Lilley & Reynolds, Ltd. The firm still exists, but has had many name changes.

LINCOLN, FREDERICK W., born Boston 27 February 1817, a grandson of Paul Revere, was apprenticed to Gedney King in 1830. In 1839, Lincoln set up in business and until 1853 was at 62 Commercial Street, Boston, then until 1856 at 136 Commercial Street, "at the Sign of Mercury and Quadrant." His sign, attributed to Simeon Skilling, was given to The Bostonian Society in 1886. In 1858 one of Lincoln's apprentices, Charles C. Hutchinson, became a partner, and the firm became Frederick W. Lincoln, Jr. and Co., and moved to 126 Commercial Street. Lincoln was president of the Massachusetts Charitable Mechanics Association, and mayor of Boston during the Civil War. He died in 1898. Hutchinson had bought out the firm in 1883. The business continued until about 1940.

LORIEUX, E. A reflecting circle presented in 1864 is the only date which has been traced for this man but several other instruments with his name exist.

LOVELACE, WILLIAM, was a clockmaker at 14 Charles Street, Hoxton, England, in 1796.

MACY, BENJAMIN, worked as an instrument maker and nautical bookseller on Hermitage Bridge, Wapping, London, from about 1700 to 1730.

MAQUIN, MUHAMMAD, son of a famous maker of astrolabes and himself a royal astrolabist. Worked in Lahore about 1644 at the height of its golden age.

MARSH, ALEXANDER. The only record of this man is a listing in the 1870 Worcester *Directory*. His occupation is given as "Patent right dealer."

MARSHALL, ROY K., Research Astronomer at Yerkes Observatory; Harvard Observatory; Professor of Astronomy, University of North Carolina; Director Fels Planetarium, Philadelphia.

MASSEY, EDWARD, of Newcastle, Staffordshire, in 1802 patented a recording log and a sounding machine. The log, at least, was tested by the Captain of H.M.S. *Donegal* in 1805 and found to be an excellent device. Edward apparently moved to London as a watchmaker at 3 Tysoe Street, Spittalfields about 1826. An improvement, patent 7113, was made in 1836. Thereafter all is confusion as persons named Edward, Thomas senior and junior, E. James and John Edward Massey begin to make and sell logs from various addresses in London, all claiming as late as 1875 to be successors of the original Edward. To make matters worse Thomas Walker (q.v.) an uncle of Edward, began to make logs and sounders under the Massey patents about 1850, but the advertisements of E. & G. W. Blunt in 1853 were still offering "Massey Logs and Sounding Machines," and in 1903 Thomas Walker & Son bought out John Edward Massey's business.

MEGARY, ALEXANDER, born in Ireland in 1790, first appears in the New York *Directories* of 1823-24 with no occupation listed; 1825-27 at 54 Grand Street, as an instrument maker; 1827-28 at 64 Lispenard Street; 1829 at 3 Thames Street; 1831-35 at 238 Water Street; 1835-1865 at 190 Water Street and disappears thereafter. In 1849 he published a pamphlet *Navigation, Latest and Improved Methods*. He died 7 November 1850, but his business was continued by others for several years.

MELLING & CO. First entry in the Liverpool *Directory* is for Melling & Payne, Navigation Warehouse 39 South Castle Street. In 1847 the name became Edward Melling & Co. and the last entry is in 1851.†

MERGENTHALER LINOTYPE CO. Organized in 1887 in Baltimore to manufacture a precision machine invented largely by Ottmar Mergenthaler to set type mechanically. The company soon became world-wide in scope and in World War II made high precision instruments under contract with the United States Navy.

MERRILL, ROBERT, has a double listing in the New York *Directories* as a mathematical instrument maker, first in 1835-36 with William C. Davis in the firm of Merrill & Davis, 36 Oak Street; 1836-37 at 157 South Street; 1837-38 at 255 Front Street; 1838-40 at 138 Water Street. In 1840 Merrill is alone at 163 Water Street and Davis is alone at 302 Pearl Street. In 1845-50 at 149 Maiden Lane; 1855-60 at 152 Front Street; to 1869 at 156 Water Street, the name now being Robert Merrill & Sons. With slight name changes the firm

continued to 1924. Robert was born in Newburyport, Massachusetts, 19 April 1804, died Brooklyn, New York, 1876. The sons were William (1828-1898) and George W. (1838-1903).

Messer, John J., was a nautical instrument maker at 78 Christian Street, Commercial Road in the 1869-75 London *Directories*.

Morrison, Frank, in Cleveland, Ohio, was a compass adjustor and instrument maker, early twentieth century.

Negus. This firm, still existing, has failed to answer any mail concerning their history. So far as can be discovered, it began about 1850 at 84 Wall Street, New York, with Thomas S. Negus selling chronometers. In 1864 it became Thos. S. & Co. at 100 Wall Street. In 1869 Thos. S. and John D. Negus. T. S. & J. D. Negus today at 69 Pearl Street.

Newell, Charles, is a son of the Andrew Newell listed in the 1789 Boston *Directory*, mathematical instrument maker at 61 State Street. Following the father's trade, in 1800 Charles' brother, Joseph, is listed as a mathematical instrument maker in Merchant's Row. In 1805 Charles is listed as a mathematical instrument maker at 11 Merchant's Row and Joseph as a ship chandler at the same address. Charles continued until 1810 with Joseph carrying on until 1820 when the firm name became Lincoln Fearing & Co., ship chandlers.

Norie, J. W. & Co. In 1812 grew out of William Heather which had been organized in 1765. Norie born 1772 the son of a teacher, had published by Heather as early as 1803 his *Nautical Tables* and his *Epitome of Navigation*. Norie was primarily a chart publisher but also dealt in instruments. The old firm of J. Steel was purchased in 1819. The Norie shop was at 157 Leadenhall Street and later at 156 Minories, London. Norie retired in 1839 but his successor Charles Wilson retained the old name, adding his own: Norie & Wilson. Just before 1900 Imray & Co (q.v.) merged with Norie and just after 1900 the old Laurie firm joined forces bringing together nearly all the ancient private chart producers into one business. At one time Norie had conducted a "Naval Academy" where navigation was taught.

Owens, Owen, of Liverpool. The Collection has a sextant dated 1797. There is a foul anchor stamped on the scale. No other record has been found.

Parkinson see Frodsham.

Partridge, Seth (1603-1686), English almanac compiler, surveyor and instrument designer, possibly the inventor of the slide rule. His book *Rabdologia*

first popularized the use of logarithms and included a set of "Napier's Bones," the primitive computing machine.

Pastorelli of London. The 1855-69 *Directories* list Francis Pastorelli & Co., 4 Cross Street, Hatton Garden and 208 Piccadilly as meteorological instrument makers. In 1870-75 the address was 7 Great Warner Street and 208 Piccadilly.

Patten, Richard, according to Smart was probably born in Maryland 5 August 1792. He made his first appearance as an instrument maker in the New York City *Directory* of 1813 at 350 Water Street; in 1815 at 184 Water Street; from 1820 to 1834 at 180 Water Street; from 1835 to 1840 at several addresses but no occupation. In 1841 he moved to Washington, D. C., remaining there until 1849 when he moved to Baltimore. Thence in 1860 to Washington where he died 26 October 1865. One of his labels states that he is the "only Manufacturer of Sextants and Quadrants in New York," but the quadrant owned by the Peabody Museum, while in a box having Patten's label, is marked "Spencer Browning and Rust London." His label further states "All instruments in the above line [sextants and quadrants] made to order & Warranted being divided on an Engine after the Plan of Ramsdens," which implies but does not specifically state that Patten had a dividing engine, although the warranty would be equally valid if Patten imported his instruments from a foreign maker who used a Ramsden dividing engine. Patten is perhaps best remembered as a witness in the plagarism suit between E. M. Blunt and Isaac Greenwood in 1822 and as defendant in a copyright suit by Blunt in 1828. Blunt won both.

Pixii-Dumotiez, Nicolas Constant (1776-1861), nephew and successor of the Dumotiez brothers (q.v.).

Pool, J. & H. M., began business in Easton, Massachusetts, in 1828 making all types of surveyor's equipment. Horace Murray Pool was born 9 August 1804, died 1 November 1878. Of J. Pool no record has been found. In 1878 John Murray Pool, son of H. M. Pool, succeeded to the business. Soon after his death in 1904, the business was closed.

Porter, George E., watch and clockmaker, was at 26 Merchants Exchange, Boston, in 1843 and from 1846 to 1885 at 7 Congress Street, Boston.

Ripley, Thomas, of London. Octants dated 1775, 1778 and 1782 exist and the 1797 *Directory* includes Thomas Ripley & Co., mathematical instrument maker at 364 Hermitage.

Ritchie, Edward Samuel, born Dorchester, Massachusetts, on 14 August 1814, began business in the Boston hardware firm of Palmer & Ritchie in

1839. From 1842 to 1849 he dealt in ship chandlery in New Bedford. In 1850 with a partner Nathan B. Chamberlain he set up an instrument making firm in Boston. Twelve years later Edw. S. Ritchie & Co. was organized with John Kehew (q.v.) included. In 1866 the name became Edward S. Ritchie & Son (Thomas P. Ritchie). The next year another son, John, joined as Edward S. Ritchie & Sons. In 1886 the firm moved to Brookline, Massachusetts. In 1939 the business was sold to T. S. & J. D. Negus of New York who in 1953 sold it to Sherman Brothers of Pembroke, Massachusetts. The company still continues. Edward S. Ritchie, who died 1 June 1895, was the inventor among other things, of the first practical liquid compass about 1860.

DE ROCHON, ALEXIS-MARIE, French optical designer and mathematician. Born Brest 1741, died 1817. Made a voyage with Kerguelan. In 1776 invented the telescope named for himself.

DE ROIAS, JUAN, son of a Spanish marquis. Studied at Louvain under Gemma Frisius and became his friend. In 1551, he published in France a treatise on the astrolabe on a new projection since named for him. It is not likely that he was a professional instrument maker.

ROSS, ANDREW, is listed in the 1836 London *Directory* at 15 St. John Square, Clerkenwell, and still exists as Ross Ltd., 3 Clapham Common.*

ROUX. The first known of this family of hydrographers, instrument makers and marine artists was Joseph [I] born in Martigues date unknown. He moved to Marseille, married in September 1708 and died in 1751. His son Joseph [II] was born in Marseille 11 March 1725, married 1751 and died 1793. He undoubtedly made the octant in the Museum Collection. The firm name at that time was "Joseph Roux Fils Aine," the same appearing in the French, Spanish, Italian and English labels in the 1764 edition of the chart book of the Mediterranean harbors. The next Joseph [III] was not born until the following year.

ROWLAND. Although this family had been watchmakers and silversmiths in Bristol, England, from about 1793, it was only between 1822 and 1842 when Thomas and Edward Rowland worked, and from 1842 to 1850 with Edward alone that the Rowlands called themselves mathematical instrument makers.*

S.G.D.G. is a French abbreviation similar in meaning to "Patent Applied For."

S., R. There is a plane quadrant marked "RS" dated 1632 at the British Museum and a Hadley reflecting octant at the Brick Store Museum, Kennebunkport, Maine, dated 1782 with the same mark.

SEWILL, J[OHN], of Liverpool and London, is listed in the London *Directories* 1870-75 as a chronometer maker, 30 Cornhill.

SHERMAN, C. R., worked for John Kehew (q.v.) in New Bedford, Massachusetts, from 1849 to 1859, and evidently succeeded to the business in 1865 as Charles R. Sherman & Co., 49 North Water Street; as Charles R. Sherman from 1873 to 1880. In 1881 as Charles R. Sherman & Son, same address until 1885; at 38 North Second Street until 1901; 1902 at William Street. Disappears in 1905.

SIBBERAND, CHARLES, an optical instrument maker, is listed in the 1826 London *Directory* at 34 Aldgate Within.

DE SILVA, WILLIAM. The first entry for this man in the Liverpool *Directory* is as optician, 250 Great Howard Street in 1851. 1853, 40 Regent Road; 1855, 44 Regent Road; last entry, 1857, 38 Regent Road.†

SILVER, S. W. & Co., Cornhill, are listed as Navy Agents, ships cabin manufacturers and outfitters in the 1869 London *Directory*.

SMITH & RAMAGE. This firm was founded at Aberdeen, Scotland, in 1852 when Charles Smith, watchmaker and Charles Ramage, nautical instrument maker, joined forces. Address 45 Regent Quay. They continued in business until 1861.*

SPENCER & Co. This seems to be one of the variants of the very well-known firm of Spencer Browning & Rust (q.v.) but no entry in the London *Directories* under this name can be found. The address 66 Wapping on a compass label of Spencer & Co. is the address of Spencer Browning & Rust from 1798 to 1830.

SPENCER BARRETT & Co. This seems to have been the mid-nineteenth century firm against which the blast of Spencer Browning & Co. about imitation was leveled. No dated instruments or *Directory* entries have been located.

SPENCER BROWNING & Co. See SPENCER BROWNING & RUST. Spencer Browning & Co. are listed in the London *Directories* 1868, 1869 and 1870 as "Mathematical, nautical and optical instrument manufacturers, 111 Minories and 6 Vine Street" and "Bunting factors & flagmakers, map & chart sellers, nautical stationers, etc." In 1875 as "Optical instrument manufacturers see John Browning." In the 1851 London edition of Marryat's *Code Book* an advertisement of Spencer Browning & Co. stated "Late Spencer Browning & Rust, 111 Minories & 6 Vine Street, America-Square." This is the period when labels in instrument boxes call attention to an imitator with a similar firm name, i.e., Spencer Barrett & Co.

Spencer Browning & Rust. See also Spencer & Co., Spencer Barrett & Co., Spencer Browning & Co. There are more extant instruments by this firm than by any other. It seems to have been the Ford Motor Co. of its day and may well have invented "mass production" before the American clock and firearms makers. The Peabody Museum has over forty marked instruments from this one firm, and a comparison of hardware on many other instruments either unmarked or marked with other names indicates Spencer Browning & Rust manufacturer. It would appear that the firm sold at wholesale to dealers all over England and America.

Nothing is known of Spencer or Browning, but a sinical quadrant at Oxford dated 1780 is signed by Richard Rust. The firm, Spencer Browning & Rust, first appears in the London *Directories* between 1780 and 1784 at 327 High Street, Wapping, London. Clay and Court in their *History of the Telescope* state the firm was at 123 Wapping in 1791, but if so, it was back at 327 High Street in 1797 according to the London *Directory* of that year. In 1798 they moved to 66 High Street, Wapping, and remained there until 1840 when they moved to 111 Minories. In 1843 the name was changed to Spencer Browning & Co. and a factory at 6 Vine Street, America-Square came into being. However the new firm continued to use older ivory scales marked "SBR" in script. It was at this period when the advertising labels calling attention to imitators were published. In 1847 John Browning took over the business of George Stebbing (q.v.), deceased, at Portsmouth. In the 1850's Miss Fisher has found that the name reverted to Spencer Browning & Rust but soon afterward John Browning took over the business with four shops in the Strand area, and in 1856 a W. S. Browning was selling Spencer Browning & Co. instruments in Liverpool. By 1886 Browning apparently was selling optical goods at only one shop at 86 Strand. The business has not been traced further.

Spooner, C. No record of this man can be found in Boston.

Star Compass Co. This firm, still in business, is listed in the 1915 Boston *Directory*.

Stebbing, George. He was working at 66 High Street, Portsmouth, England, from the early nineteenth century. In 1810 he patented a form of compass and is said to have invented lighting compasses from below. Just before 1845, the firm was known as George Stebbing and Son. In that year the son set up in business for himself at Southampton. The father died about 1847 and the firm passed to Spencer Browning & Co.*

Sterrop. The first of this name known to be an instrument maker was Thomas [I] who was apprenticed in 1699, was Master of the Spectacle Makers Company in 1701 and last mentioned in 1715. His brother Richard was apprenticed

in 1678, but not known of thereafter. Ralph, son of Thomas [I], was apprenticed also in 1678, Master of the Spectacle Makers Company 1706 and last known in 1734. Thomas [II] was apprenticed in 1701 and died before July 1725. George, son of Thomas [II], was apprenticed to his mother in 1730 and died 1756. But the George who made the octant owned by the Peabody Museum, dated 1772, has not been traced.

SWEETSER, GEORGE H. First listed 1860 as a nautical instrument dealer at 83 South Street, New York. In 1861 at 88 South Street; 1863-67 at 163 South Street; 1868-69 at 39 Burling Slip and 1870 at 75 South Street.

TENNENT, THOMAS, of Newburyport, Massachusetts, cannot be found in the *Vital Records*, the city *Directories* or through the local newspaper index.

TENNENT, THOMAS, in San Francisco, California, by September 1850, perhaps in June. An advertisement in the *Alta California* states that he came from Philadelphia but his name does not appear in the 1847-50 Philadelphia *Directories*. His addresses were: June 1850, Sacramento Street; 1850, "Sign of the Quadrant," Commercial Street; 1852, 134 Montgomery Street, also Long Wharf and Front Street; 1854, 29 Commercial Street, corner of Front Street "Sign of the Wooden Sailor"; 1856-62, U. S. Court Building (also called Merchant's Exchange Building), corner of Battery and Oregon; 1862, Thomas Tennent & Co., 203 Montgomery Street, John C. Sack, successor to Tennent, but Tennent also continued to be listed in the city *Directory* at Battery and Oregon Streets; 1867-74, 508 Battery Street; 1874, 423 Washington Street; 1899, no longer listed. Published *Tennent's Nautical Almanac for the Pacific Coast; California Tide Register, and Marine Digest* from about 1864 on. He also invented and patented an artificial horizon.

THAXTER, SAMUEL, born 13 December 1769 in Hingham, Massachusetts, may have been an apprentice of William Williams (q.v.), who shortly after Williams' death married his niece and the same year, 1792, began business for himself in the old Williams shop at 1 Long Wharf, Boston. The next year he moved to 9 Butler's Row. Between 1796 and 1806 he was at 49 State Street; until 1813 at 51 State Street; and through 1826 at 27 State Street. The business became Samuel Thaxter & Son in 1822 when Joseph H. Thaxter entered the business. In 1826 the firm moved to 125 State Street where it continued with Samuel Thaxter Cushing in control. Later an old employee, H. R. Starrat, purchased the business, but no change was made in the firm name. The business was closed about 1930. The old shop sign of the "Little Admiral" used continuously by Williams and Thaxter was acquired by the Bostonian Society in 1916-17.

THOMAS, SETH, began the clockmaking business at what is now Thomaston, Connecticut, in 1813. The business still continues as General Time Instrument Co.

TOBIAS, MORRIS, of London was in 68 Bell Dock Yard, Wapping, in 1804. In 1808 there were shops in both London and Liverpool under the name of M. J. Tobias & Co. In 1812 he patented (number 3584) a binnacle time piece to show time by bells. Such a clock, marked "Tobias" is owned by the Maryland Historical Society, Baltimore, Maryland. An advertisement by E. M. Blunt in 1817 includes the Morris Tobias "Binnacle Time Keeper which superceeds the use of [sand] glasses & C." From 1816-42, the business was under the name of Tobias & Levitt at 31 Minories. Morris is listed in the 1826 and 1836 *Directories* at the same address as "Chronometers."

TROUGHTON, EDWARD, of London was beyond doubt one of the most important makers and designers of instruments. Born in 1753, at the age of seventeen he began working for his brother John who was managing an uncle's instrument business in Surrey Street, Strand. In 1782 the brothers set up at 136 Fleet Street at the sign of "The Orrery." Back of them were at least three older instrument makers: their uncle Benjamin Cole in 1748 had succeeded Thomas Wright (instrument maker by appointment to the Prince of Wales, 1718, and to George II, 1733); before him had been the famous John Rowley, a maker before 1700, who became George I's Master of Mechanics about 1715 and died 1728. In 1778 Edward made a dividing engine, patterned after Ramsden's, possibly the third such machine in England, but so large was their business that many of their scales were divided by Fayrer (q.v.). When John died has not been discovered, since his brother so overshadowed him, few facts are known. Edward designed many astronomical instruments and for the use of navigators, the "pillar" sextant in 1788, a circle in 1796 and a dip sector. He retired in 1831 and died in 1835. Five years before retiring he had taken a partner William Simms into the business and the firm became Troughton & Simms.

Simms was thirty-three years old when he joined the firm. Behind him was a tradition almost as great as that represented by Troughton. William's father, also a William, had been an instrument maker in Aldersgate, and William's two brothers, James and George, continued the father's business. But William had been apprenticed to Bennett, one of Ramsden's old workmen, and when his time was ended, struck out for himself. He invented the automatic dividing engine and designed many of the finest astronomical instruments of the period. Among other honors, he was elected a Fellow of the Royal Society. He died in 1860.

By 1836 William Simms had taken in partnership a nephew, also a William, and just before his death, a cousin of the same name. The business was then at

138 Fleet Street. Later the factory was moved to Charlton, Kent. The business was still listed in the 1863 *Directory*.

URINGS, JOHN, is listed in the 1766 London *Directory* as an instrument maker and shipchandler in St. Catherines. The University of Edinburgh has a Davis quadrant dated 1752 and Kronborg an octant dated 1763. An undated telescope, microscope and octant are also known.

WALKER, ALEXANDER. Mr. Paget-Tomlinson has found John and Alexander Walker first enter the Liverpool *Directories* in 1823 as engravers at 33 Pool Lane. In 1827 at the same address they are called opticians. 1837 the address is 34 South Castle Street. 1839 at 72 South Castle Street, they are called Stationers and Mathematical Instrument Makers. 1857 Alexander Walker & Co., 72 South Castle Street, opticians. 1865 Nautical Instrument Manufacturers and adjustors of iron ships' compasses. 1879 is the last entry for the firm.†

WALKER, RALPH, of the Island of Jamaica about 1793 developed an excellent mariners' compass as a part of a very complicated device to determine longitude by magnetic variation. The device was found to be without merit, but the compass was so good it was adopted by the Royal Navy as an azimuth compass from 1795 to 1819. The so-called "London Polaris" invented by D. Macgregor in 1875 and sold by instrument makers in the twentieth century was almost a complete copy of Walker's 1793 instrument.

WALKER, THOMAS, was born in London in 1805. His mother, who died soon after Thomas' birth was the sister of Edward Massey (q.v.); his father remarried quickly. With an unfortunate home life, Thomas ran away and began to work in a china factory at Etruria. Later he was apprenticed to a clockmaker. In 1836 he moved to Birmingham and opened a clock shop. Among other things he invented a stove which he patented and manufactured and sold. About 1850 he began to make logs and sounders under the Massey patent. In 1861 a son, Thomas Ferdinand joined the father as Thomas Walker & Son and the same year patented the "Harpoon" log. In 1863 a new model the "A1 Harpoon" log was produced. The father having died in 1873, the son took over the business. The "Taffrail" log, renamed the "Cherub" was patented in 1879; the "Neptune" log in 1899; an electric log in 1902; the "Excelsior" and "Trident" models in 1905; the "Trident Electric" log in 1924; the "Viking" log in 1928 and the "Cherub Mark III" in 1930. In 1903 the Walker firm acquired the business of John Edward Massey, a descendant of the original Edward Massey and relative of Thomas Ferdinand Walker. Thomas Ferdinand died in 1921, but the firm is still in business under Walker management.

WATKINS, J. & W., 5 Charing Cross, London, are said to have been in business in 1791. They are in the 1797 London *Directory* as Jeremiah and Walter Watkins. The firm became Watkins & Hill in 1808. The Peabody Museum Library has their catalogs dated 1827, 1829, 1832 and 1833. The firm is listed in the 1836 London *Directory*.

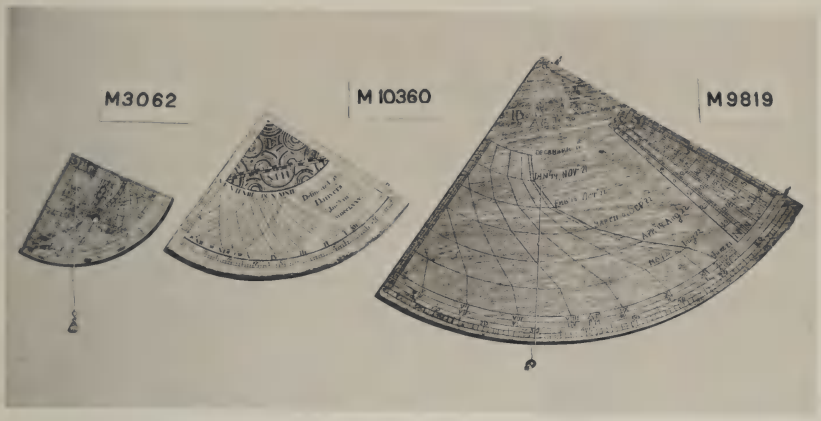
WHEELER, JOHN H., first listed in the New York *Directories* in 1825-26 at 218 Water Street. In 1827 he moved to 220 Water Street where he remained until 1835-36 when he moved to 222 Water Street. This was his last listing. In 1828-29 he had a second shop at 156 Water Street. At sometime his address was 150 Front Street, but the listing has not been found. He claimed he was "a real manufacturer" of instruments.

WIGHTMAN, THOMAS, an English born engraver, emigrated to Massachusetts about 1800. He was in Salem 1802-05 and in Boston 1805-06, but disappears thereafter. It is believed his compass card was a "stock" item used by several instrument makers who simply added their own names by means of an engraved label pasted on the card itself.

WILLIAMS, WILLIAM, was born about 1748, the son of John Williams a Boston dry goods merchant and "counterpane stamper." How he learned the instrument trade is not known but by 1768 he signed a Davis quadrant with the address "King Street, Boston." On 5 March 1770 he advertised his business "two Doors East of the Sign of Admiral Vernon, near the Head of Long Wharf, Boston." In 1774 Williams advertised in the *Salem Gazette* that he had a shop in Marblehead, stating among other things "all instruments with said William's name will be made true without Charge." The same ad has a cut of William's shop sign (reversed for composition's sake) holding an over-sized Hadley quadrant instead of the Admiral's more familar noggin of grog. Apparently Williams had acquired the sign of the tavern and converted it. During the Revolution Williams served in the Continental army, but was back in business at the head of Long Wharf in 1783, and was still there in 1789 when the first Boston *Directory* was compiled. He died on 15 January 1792, his business and shop sign passing to Samuel Thaxter (q.v.).

WOOD. In 1810 Benjamin Wood, 41 Wapping, is listed first in the Liverpool *Directories* as a mathematical instrument maker. In 1832 he had shops at 50 Wapping and Benjamin Wood, Junior, at 23 Bath Street. In 1845 the address of both was 7 Bath Street, but the son was now a "Teacher of Navigation." In 1847 only one, the teacher and optician was listed at 7 Bath Street.†

ILLUSTRATIONS



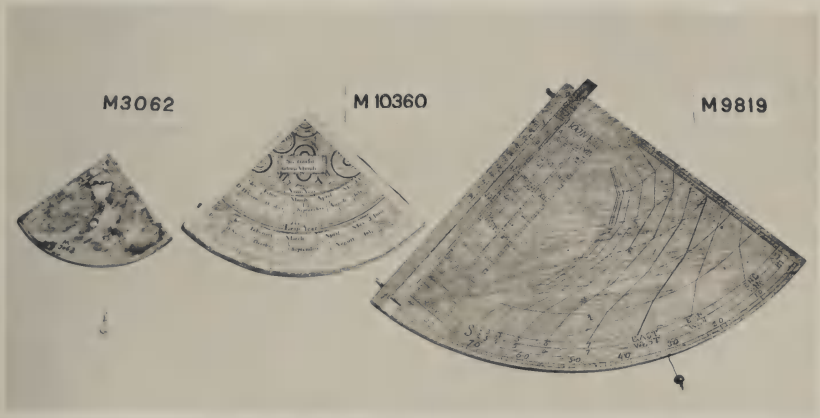


Plate I. Quadrants, face and reverse

1 2 3

Plate II. Astrolabes, face

8 5
6 7

Plate III. Astrolabes, reverse

8 5
6 7

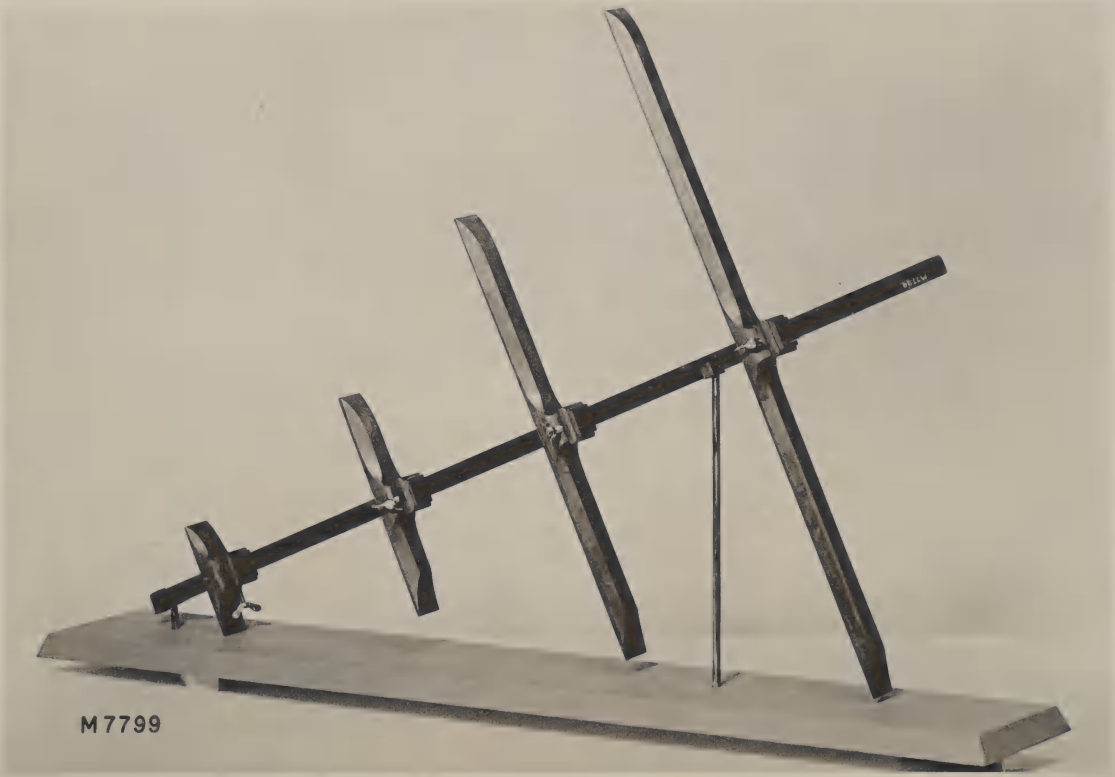


Plate IV. Cross Staff

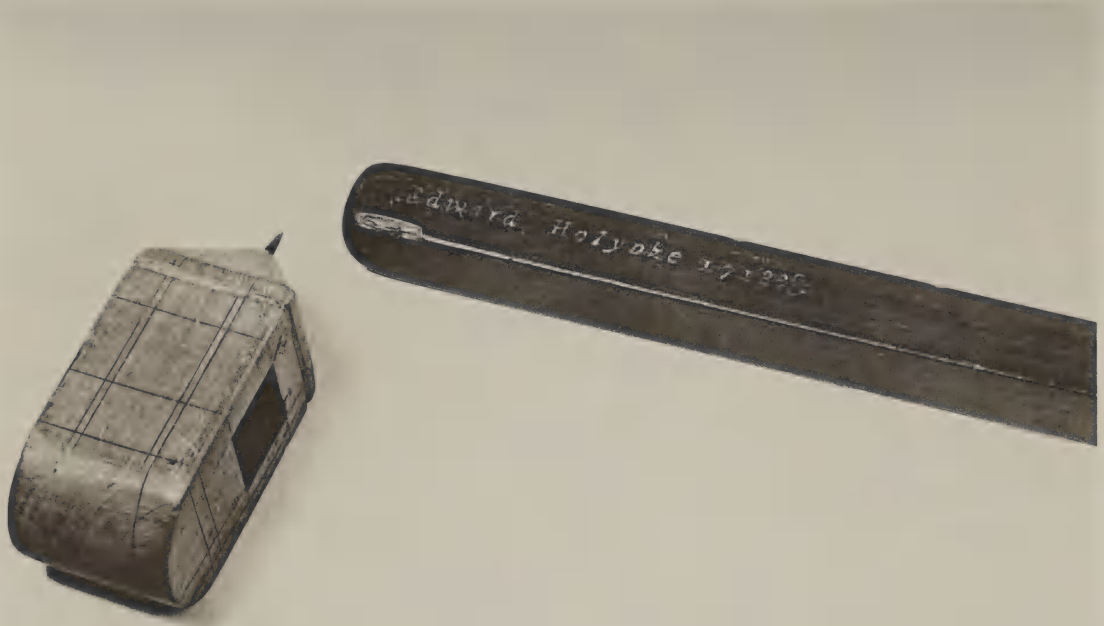


Plate V. "Dutch Shoe"

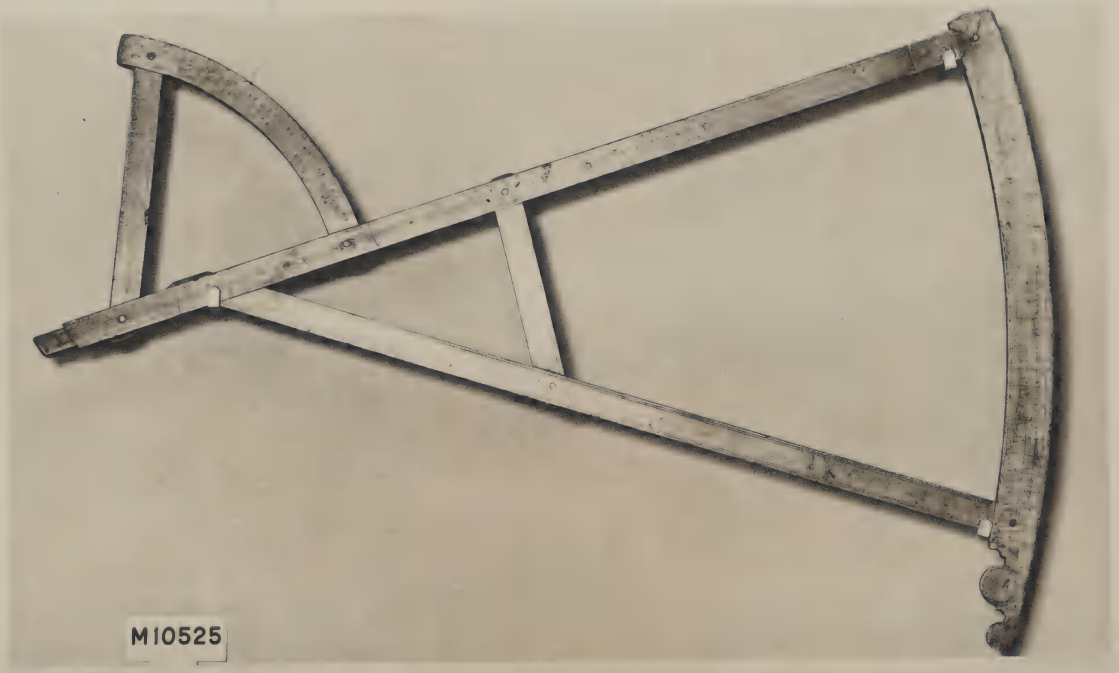


Plate VI. Davis Quadrant, 1676

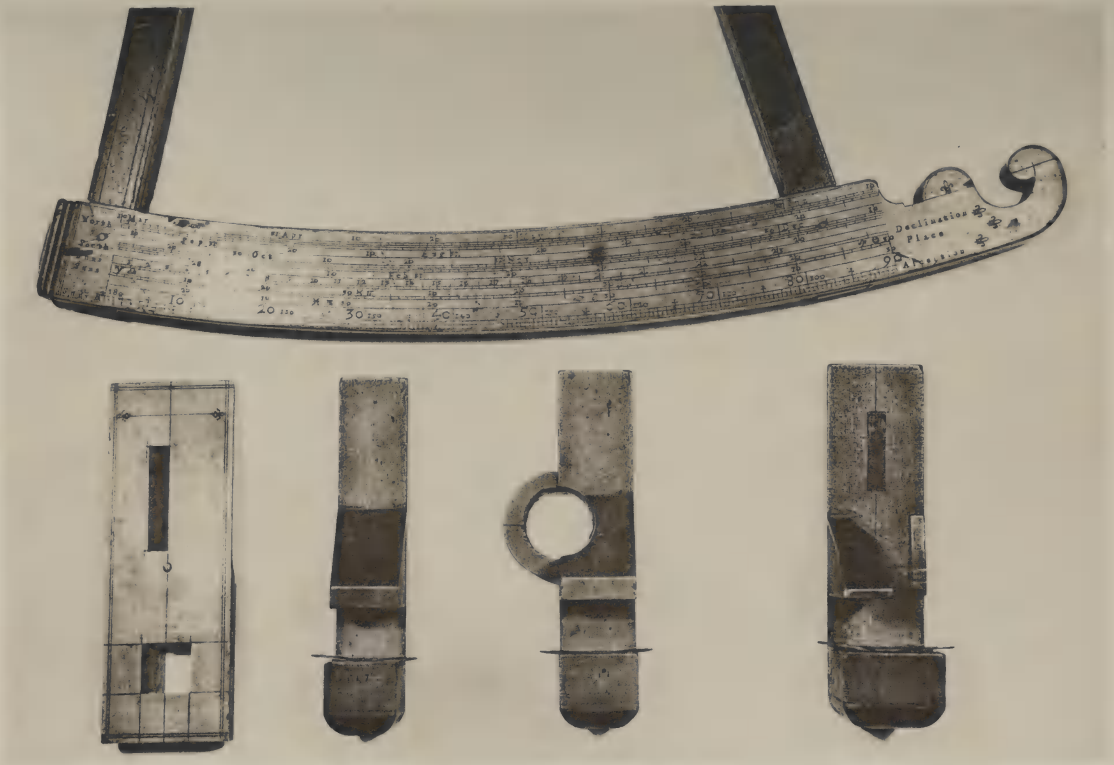


Plate VII. Scale of Davis Quadrant M9187 and Vanes of Davis Quadrant M3000

Plate VIII. Davis Quadrant, 1775. Vanes from M3000

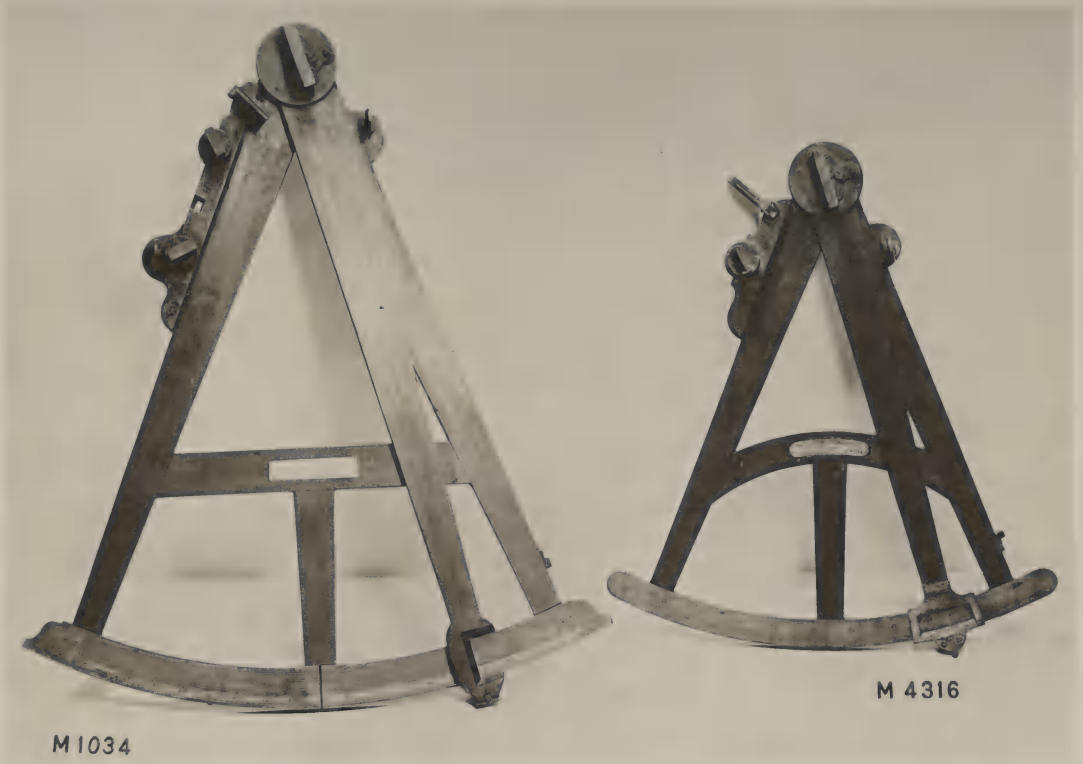


Plate IX. Hadley Quadrants, 1755 and 1758

Plate X. Hadley Quadrants, 1760

M1023

M3275

Plate XI. Hadley Quadrants, 1763 and 1784

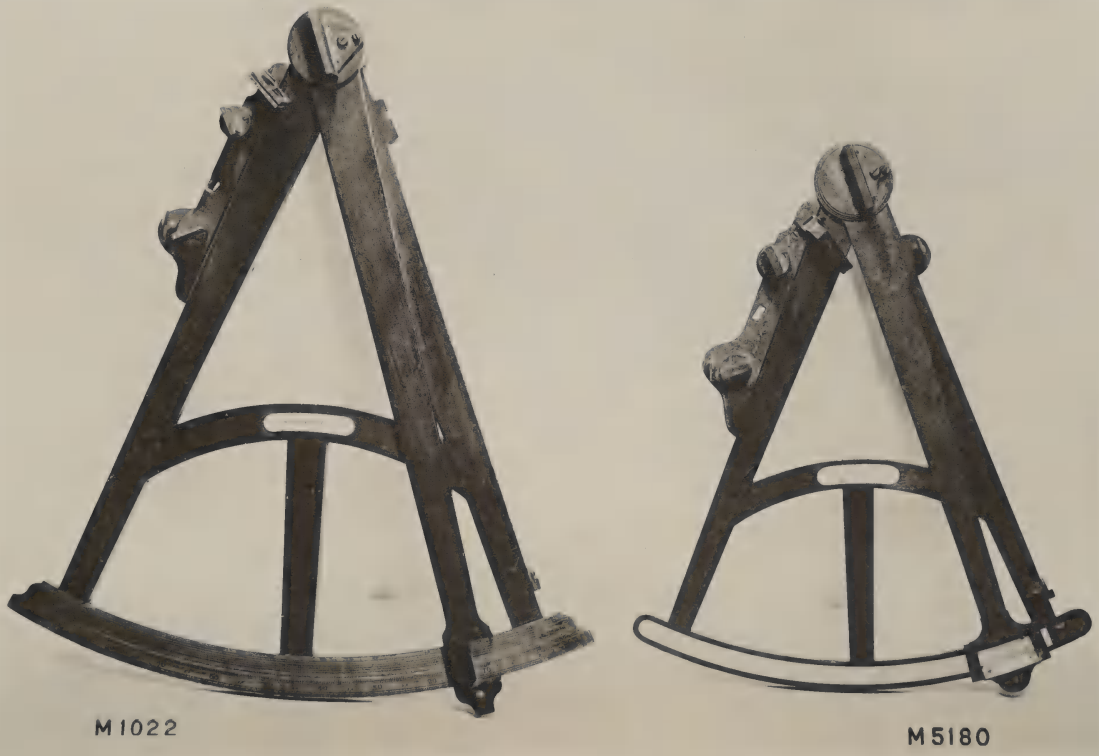


Plate XII. Hadley Quadrants, 1772 and 1773

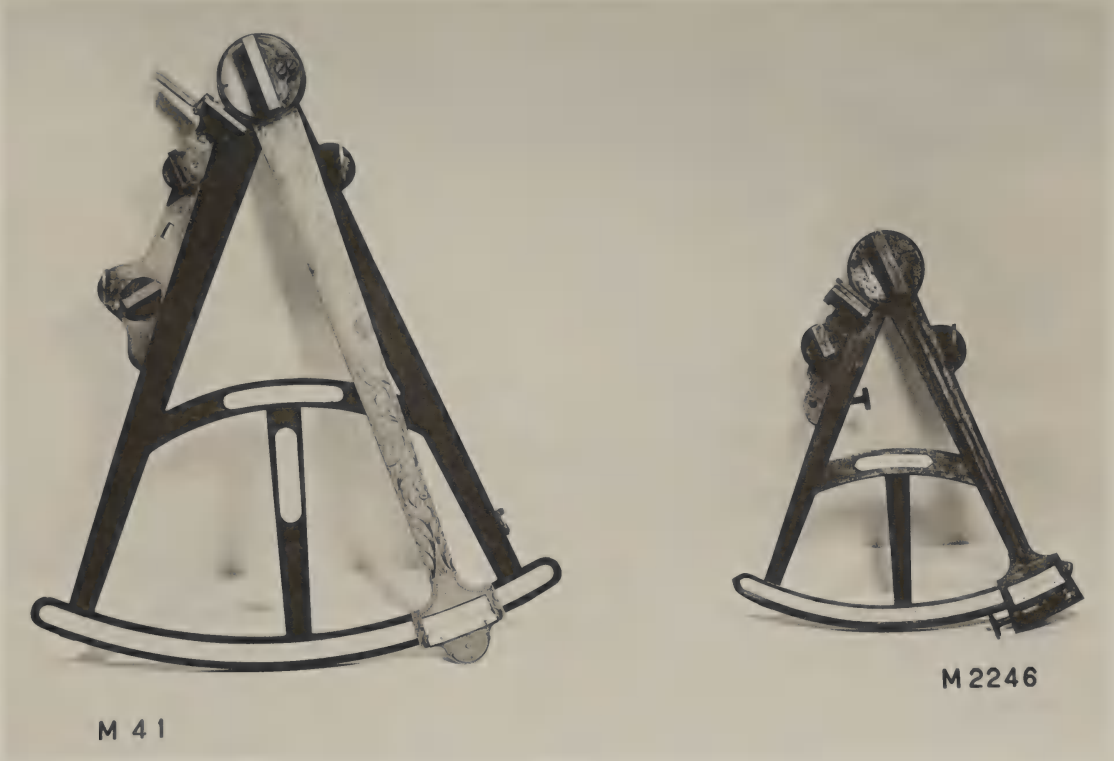


Plate XIII. Hadley Quadrants, 1790 and 1830

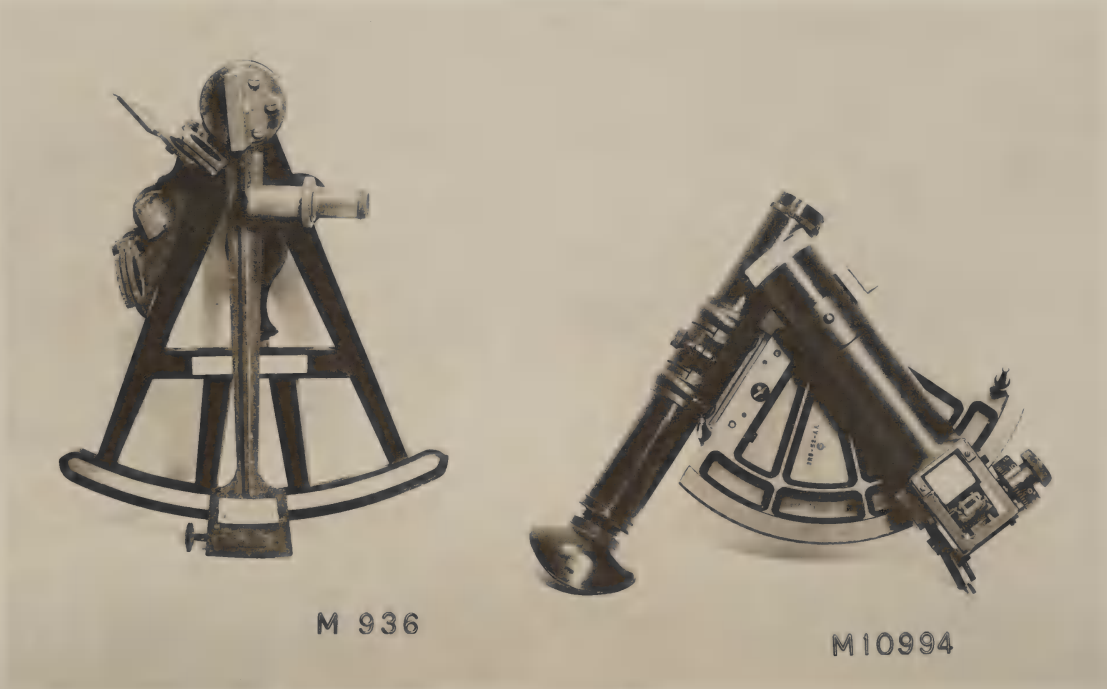


Plate XIV. Hadley Quadrant, 1840 and Ball Recording Sextant, 1944

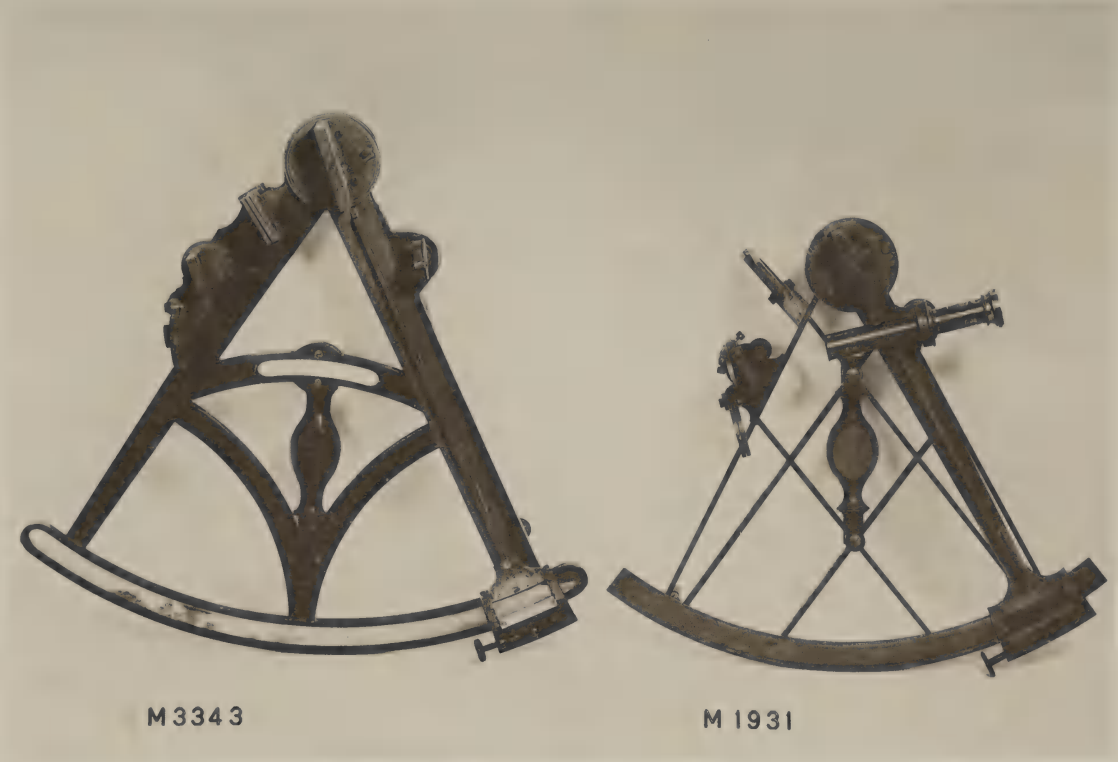


Plate XV. Sextants, 1797 and 1800

104 107

Plate XVI. Sextants, 1833, 1838 and 1895

117 120 136

Plate XVII. Sextants, 1922, 1931 and 1945

139 141 140

Plate XVIII. Reverse sides of Hadley Quadrants

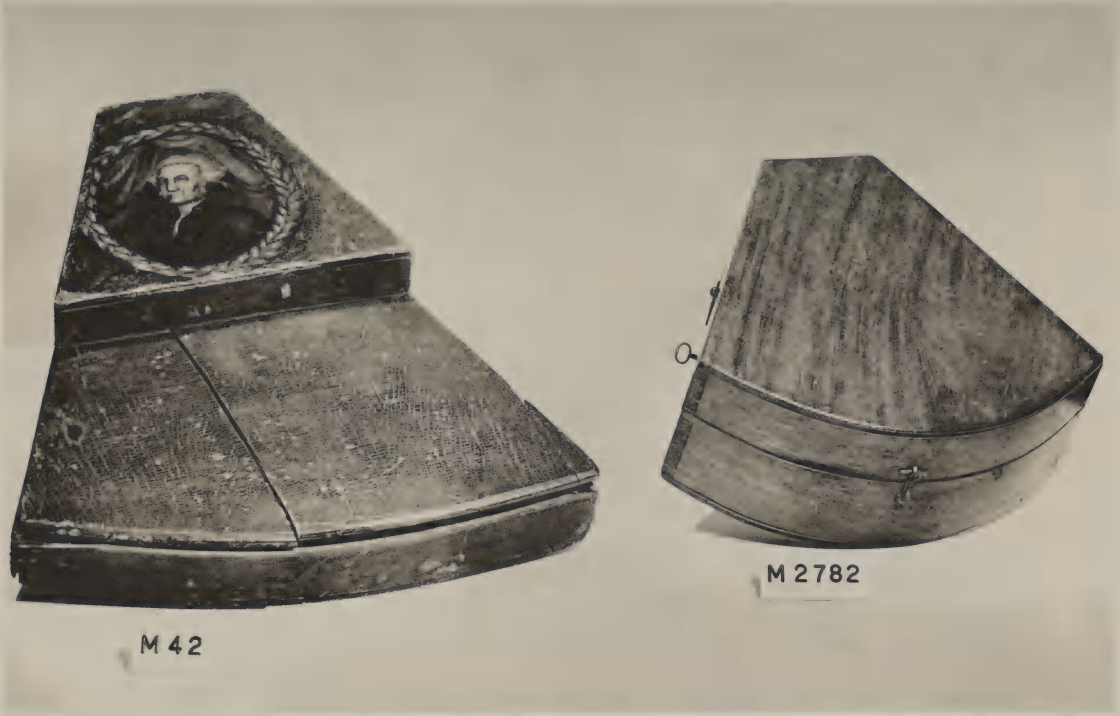


Plate XIX. Step and Keystone Boxes

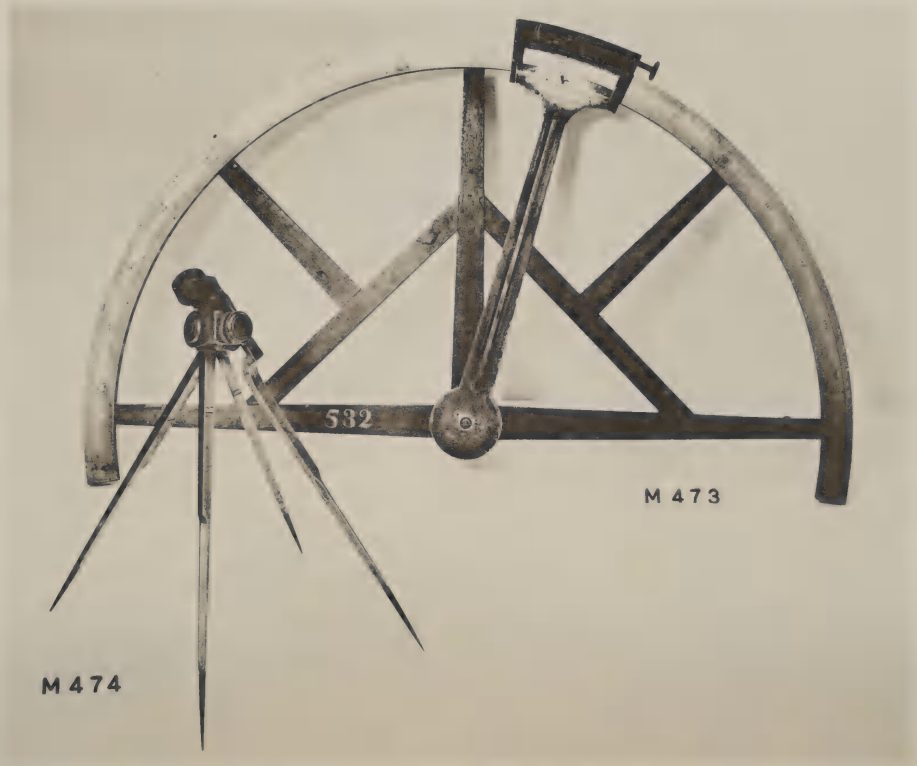


Plate XX. Half Circle and Four Leg Dividers

Plate XXI. Half Circle

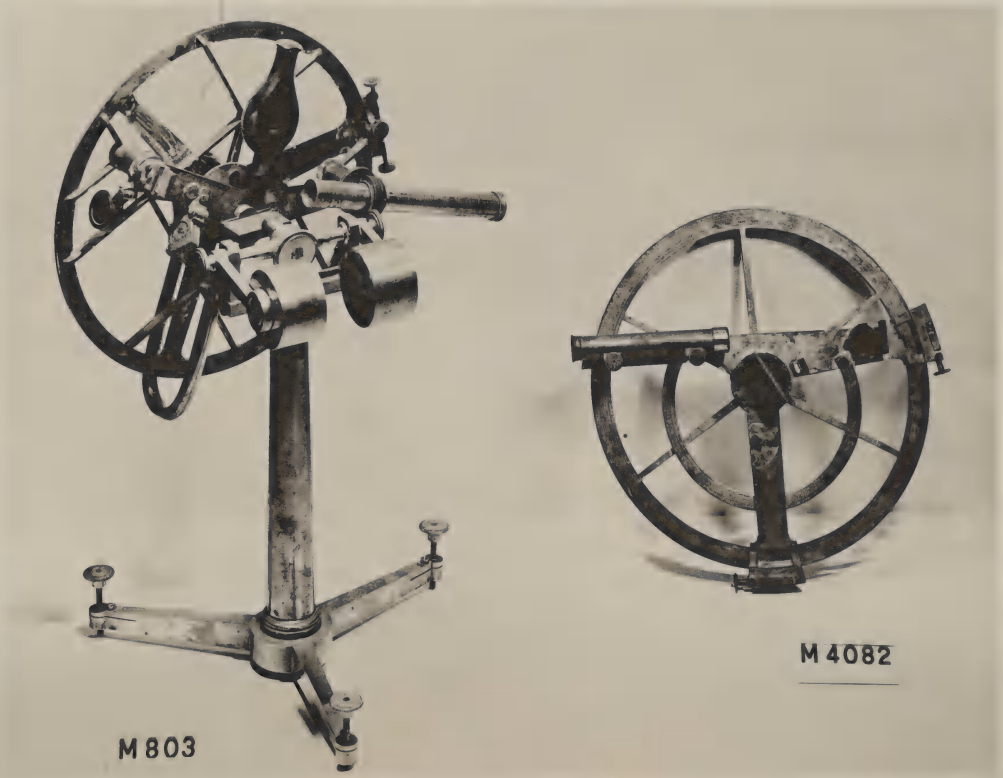


Plate XXII. Full Circles

147 146

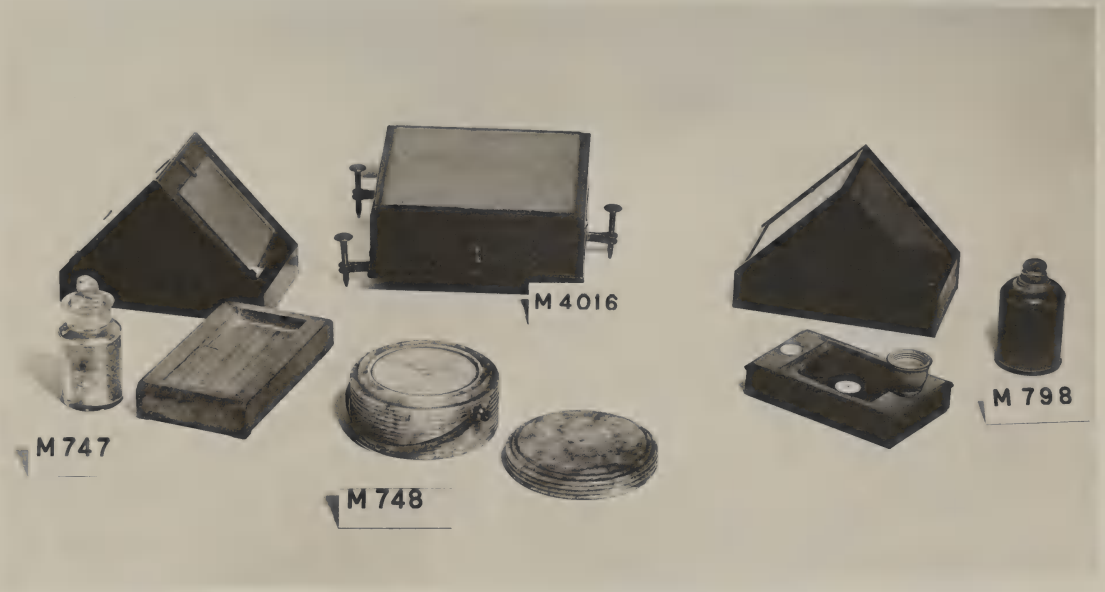


Plate XXIII. Artificial Horizons

153 152 151 154

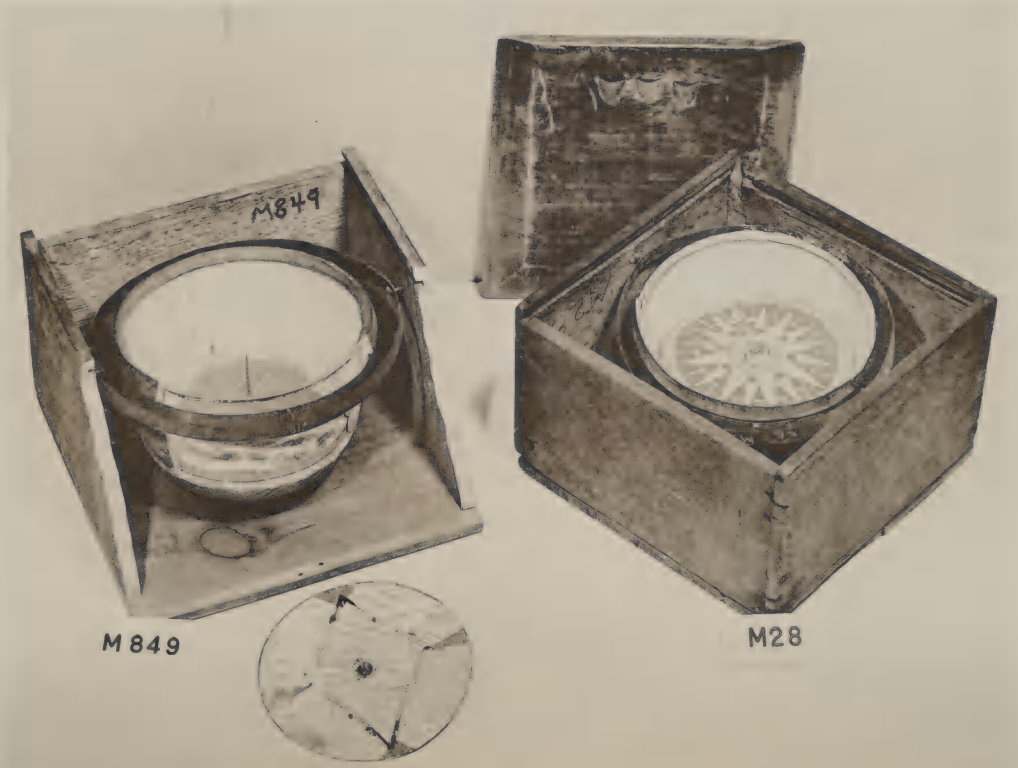


Plate XXIV. Mariner's Dry Card Compasses

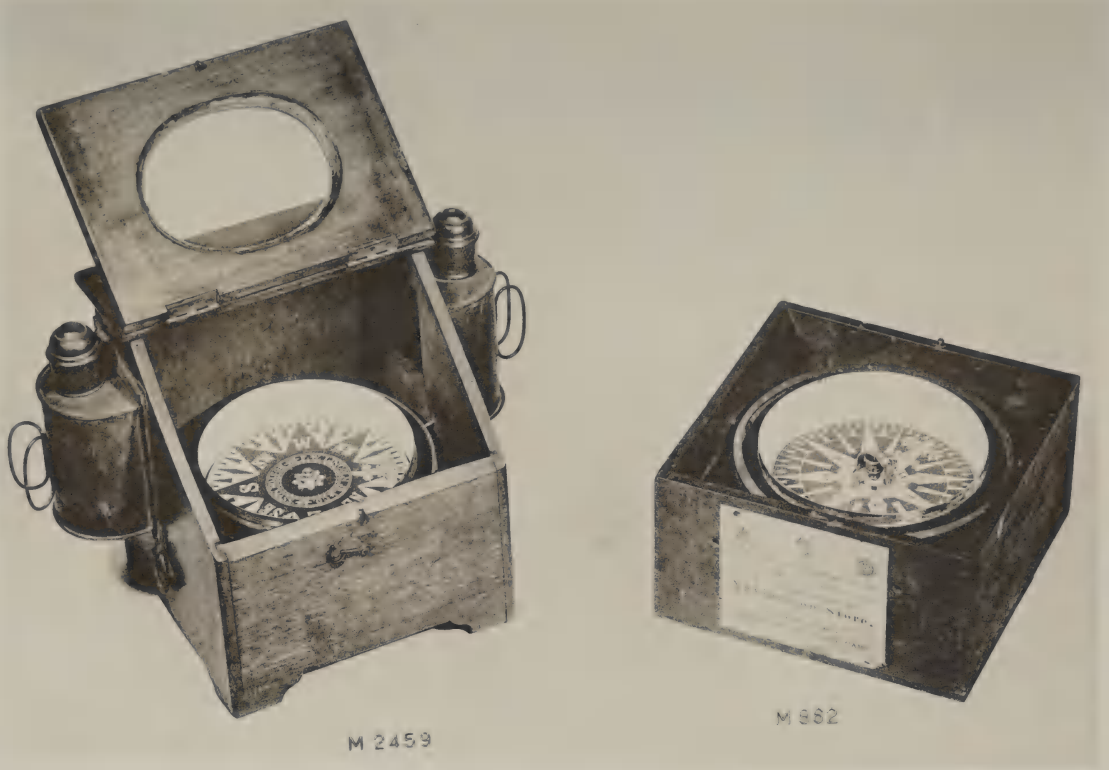


Plate XXV. Mariner's Dry Card Compasses

170 171

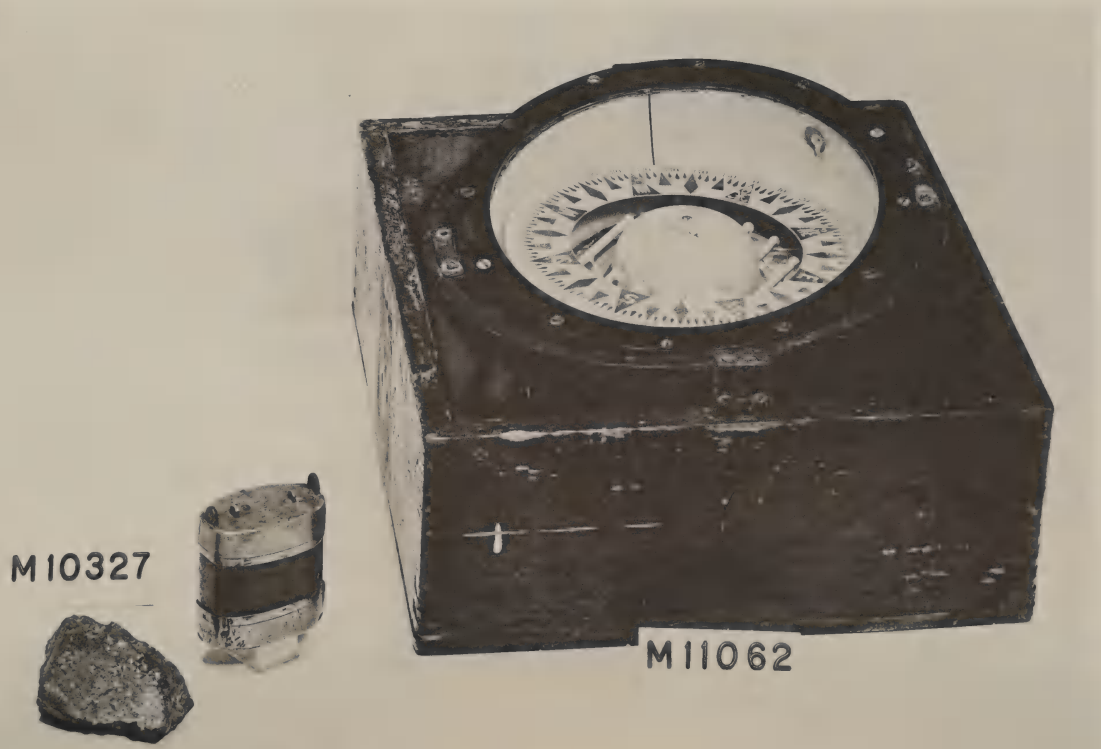


Plate XXVI. Lodestones and Liquid Mariner's Compass

Plate XXVII. Oriental Mariner's Compasses

183 182

179

181 180

Plate XXVIII. Tell Tale Compass, upper rose

Plate XXIX. Tell Tale Compass, lower rose

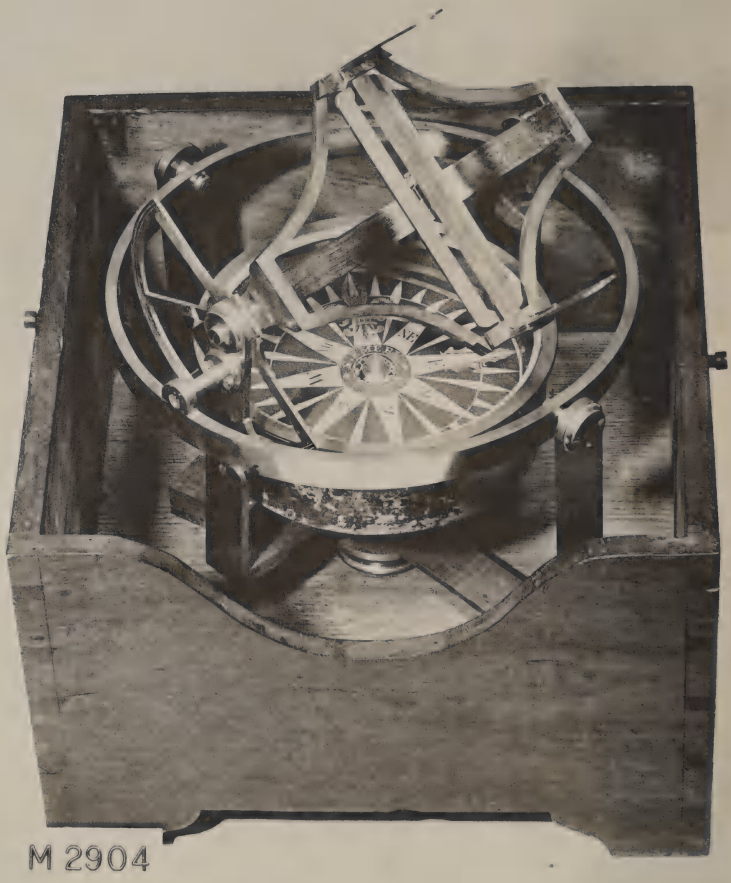


Plate XXX. Azimuth Compass

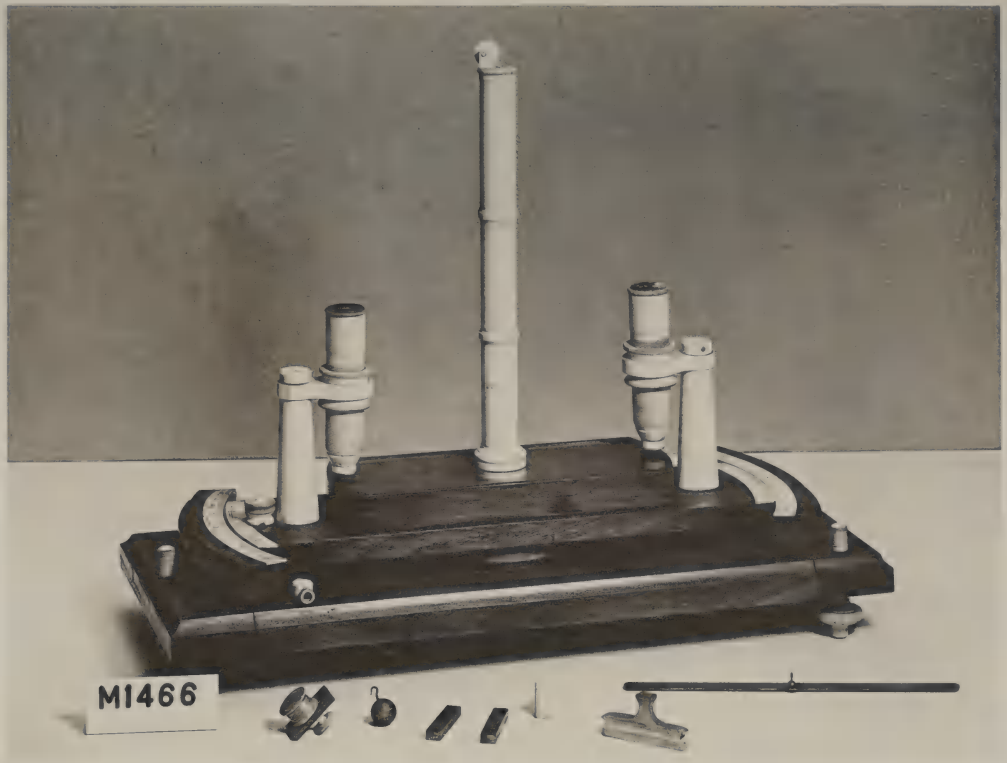


Plate XXXI. Variation Compass

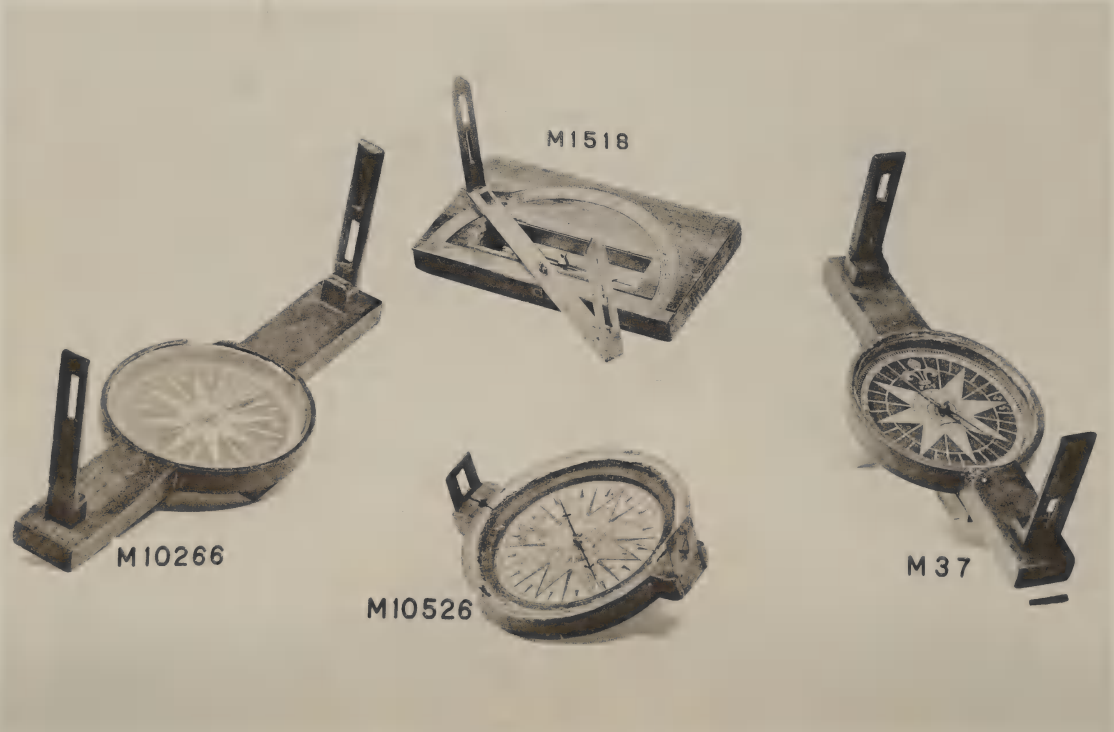


Plate XXXII. Surveyor's Compasses

199

204 200 201

Plate XXXIII. Surveyor's Compasses

205

203 202 206

Plate XXXIV. Universal Ring Dials

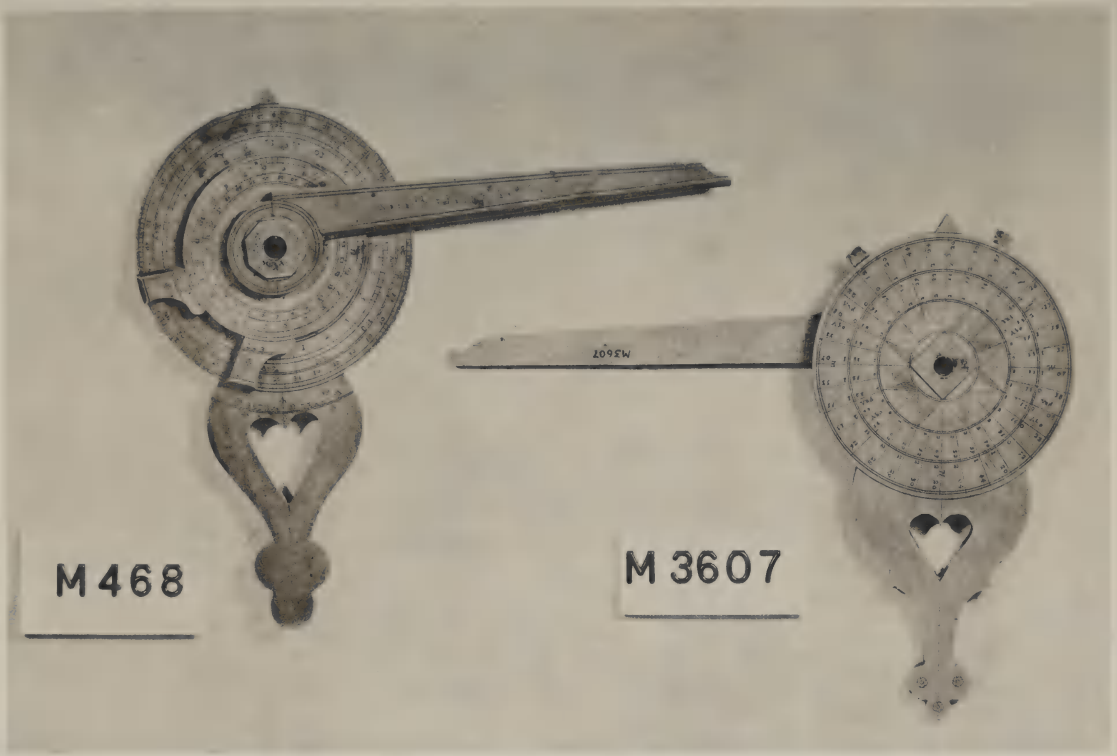


Plate XXXV. Nocturnals

214 217

Plate XXXVI. Sand Glasses

226 221 219 228 223 224

Plate XXXVII. Mechanical Log Timers

Plate XXXVIII. Dutchman's Log Timer

Plate XXXIX. Chronometers

Plate XL. Ships Clocks

239 240 243

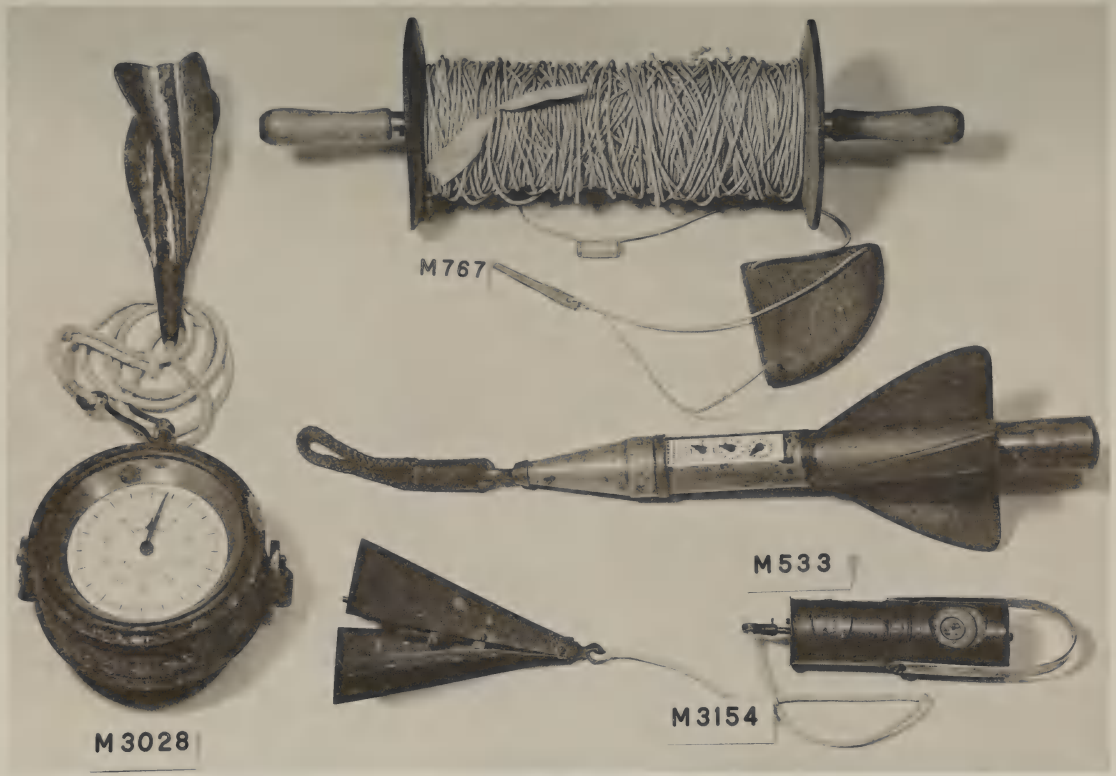


Plate XLI. Logs

244
249
250 247

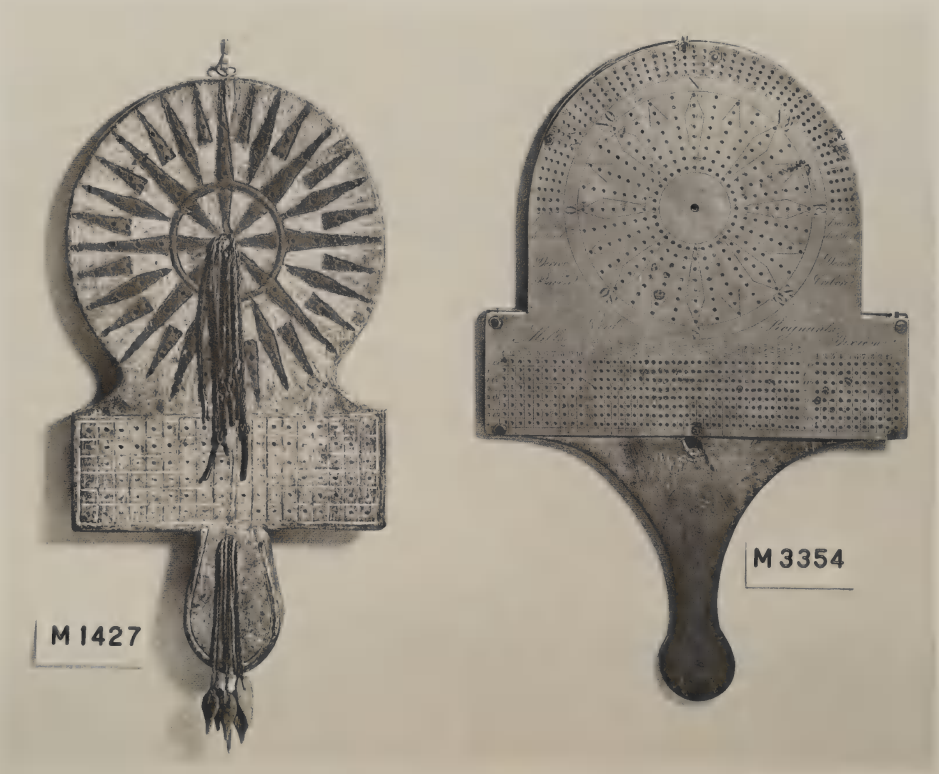


Plate XLII. Traverse Boards

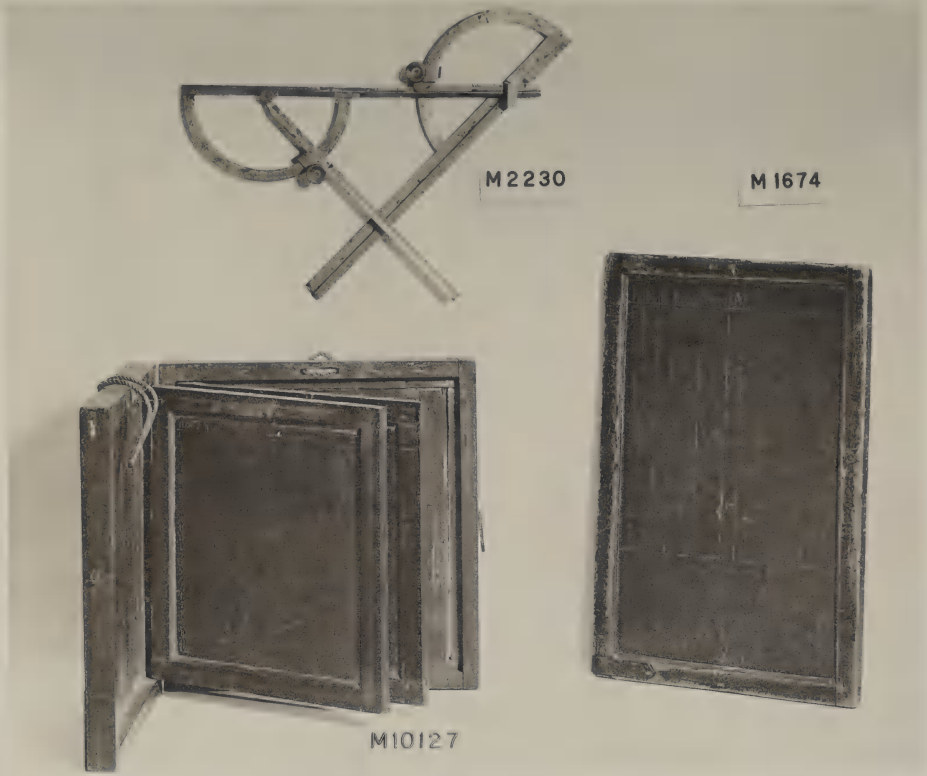


Plate XLIII. Log Slates and Trigonometer

263 255

257

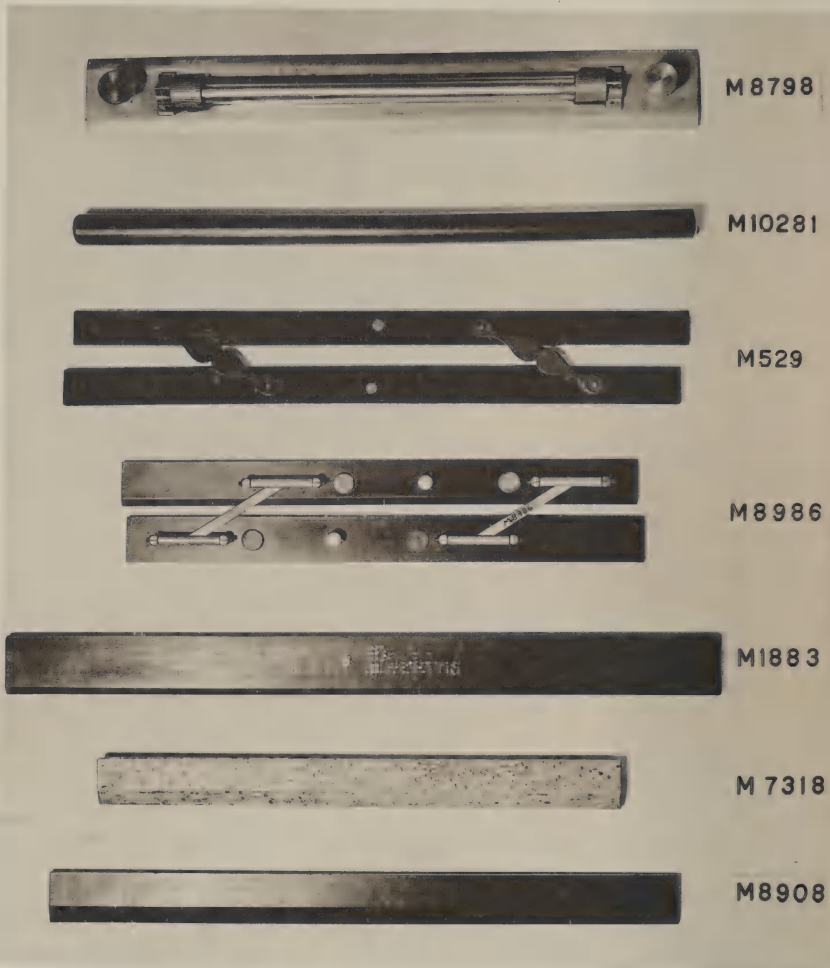


Plate XLIV. Straight Edges and Parallel Rulers

273 268 269 272 265 266 264

Plate XLV. Dividers and Protractors

274 275 278 279
281 283 284

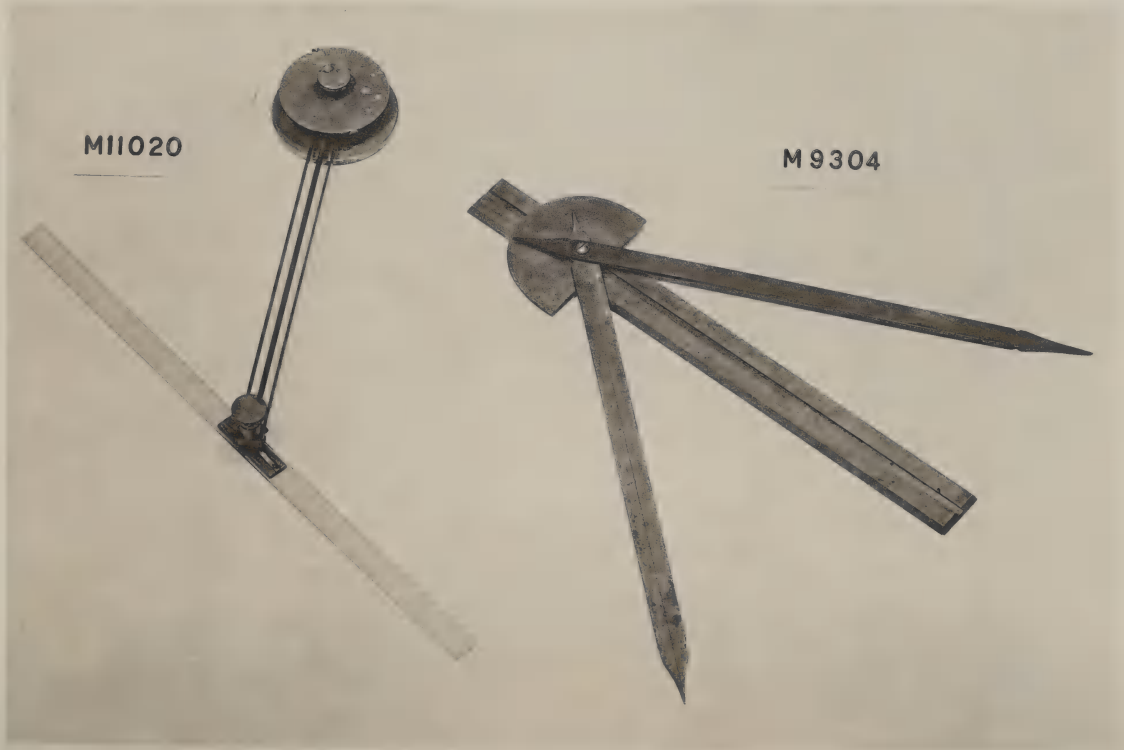


Plate XLVI. Course Protractor and Station Pointer

Plate XLVII. Drafting Instruments

289

292 288

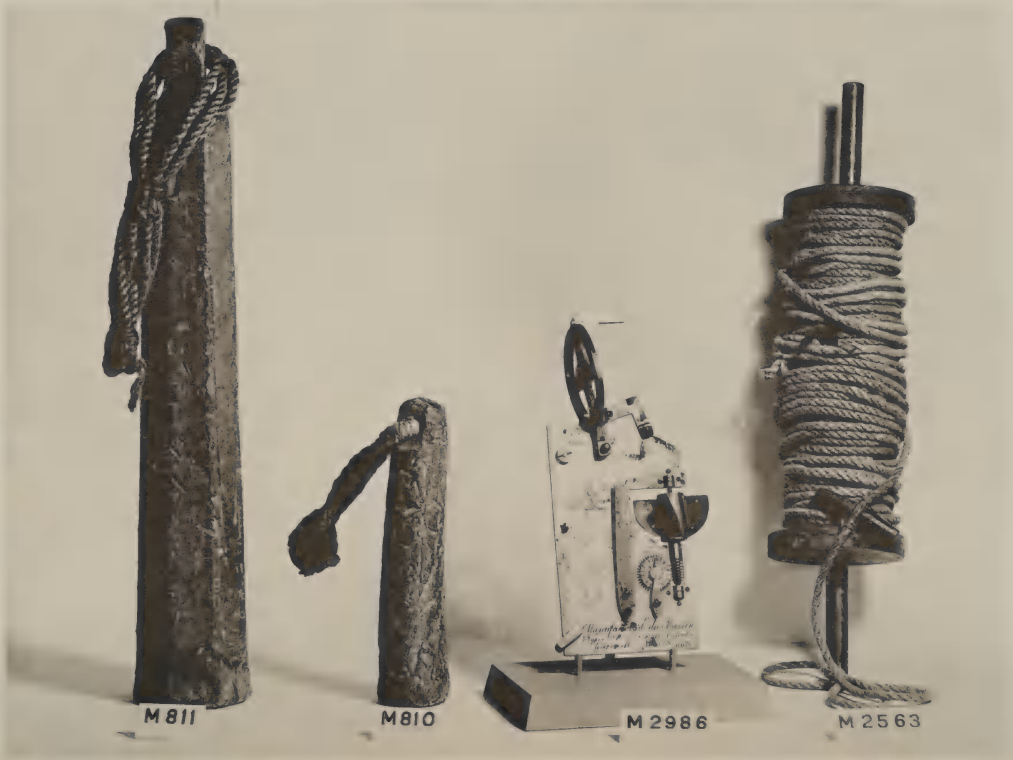


Plate XLVIII. Sounders

298 296 299 297

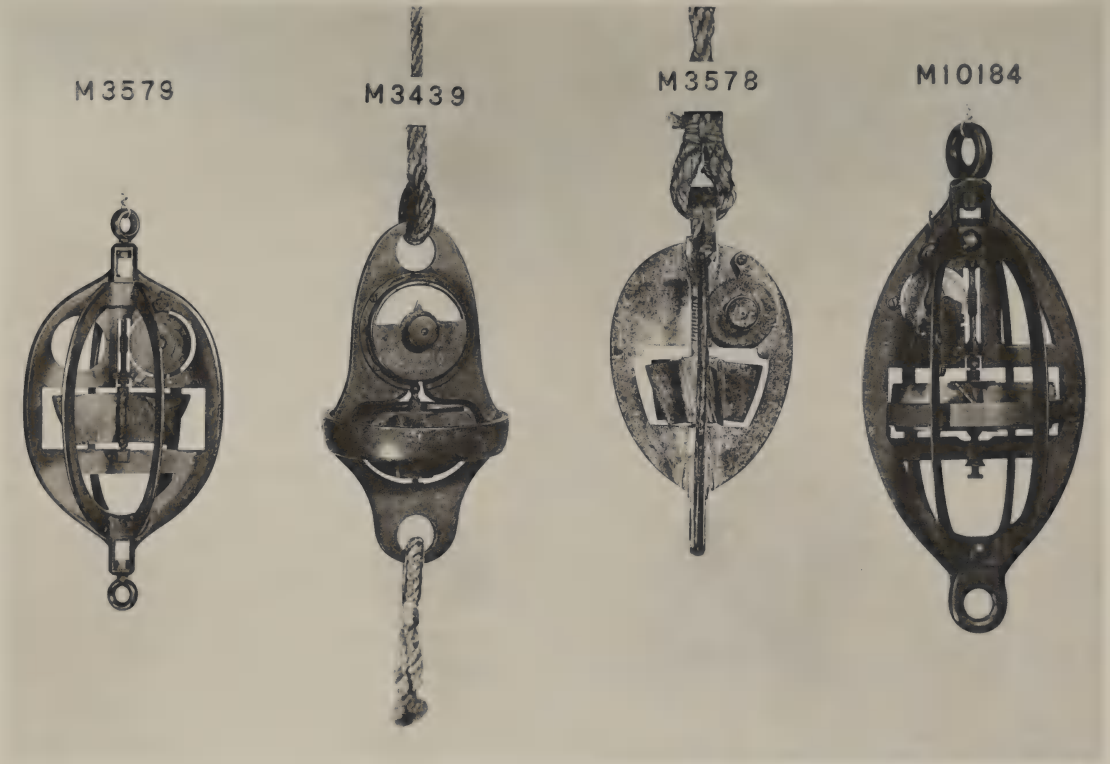


Plate XLIX. Sounders

302 300 301 304

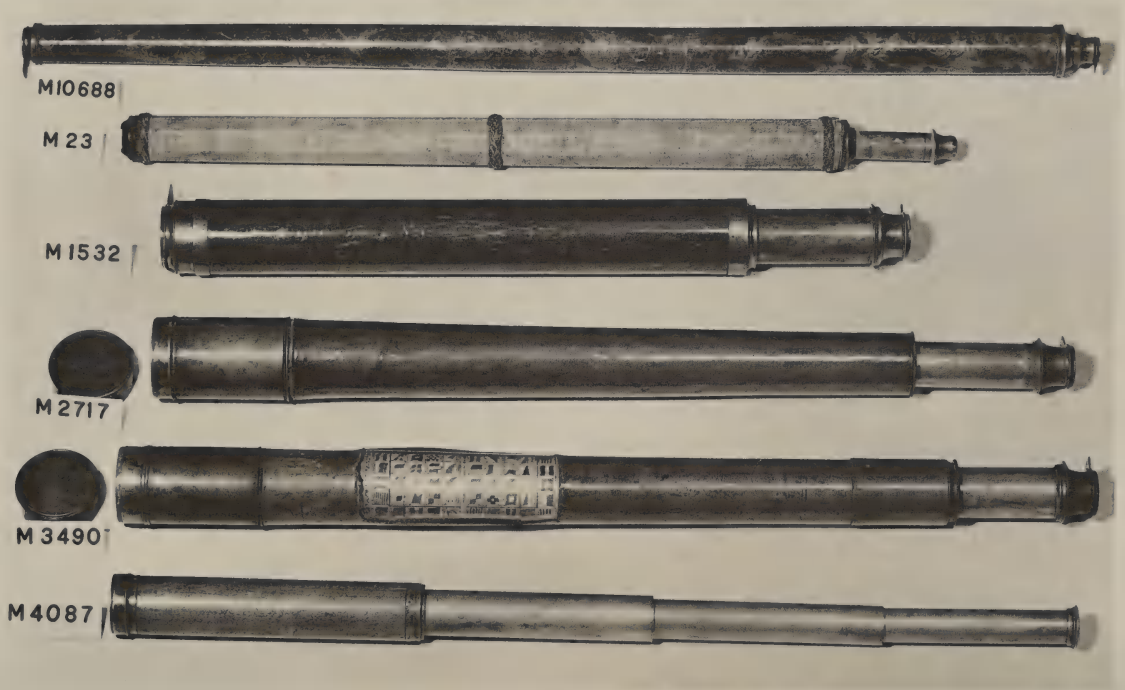


Plate L. Telescopes

307 309 357 321 322 353

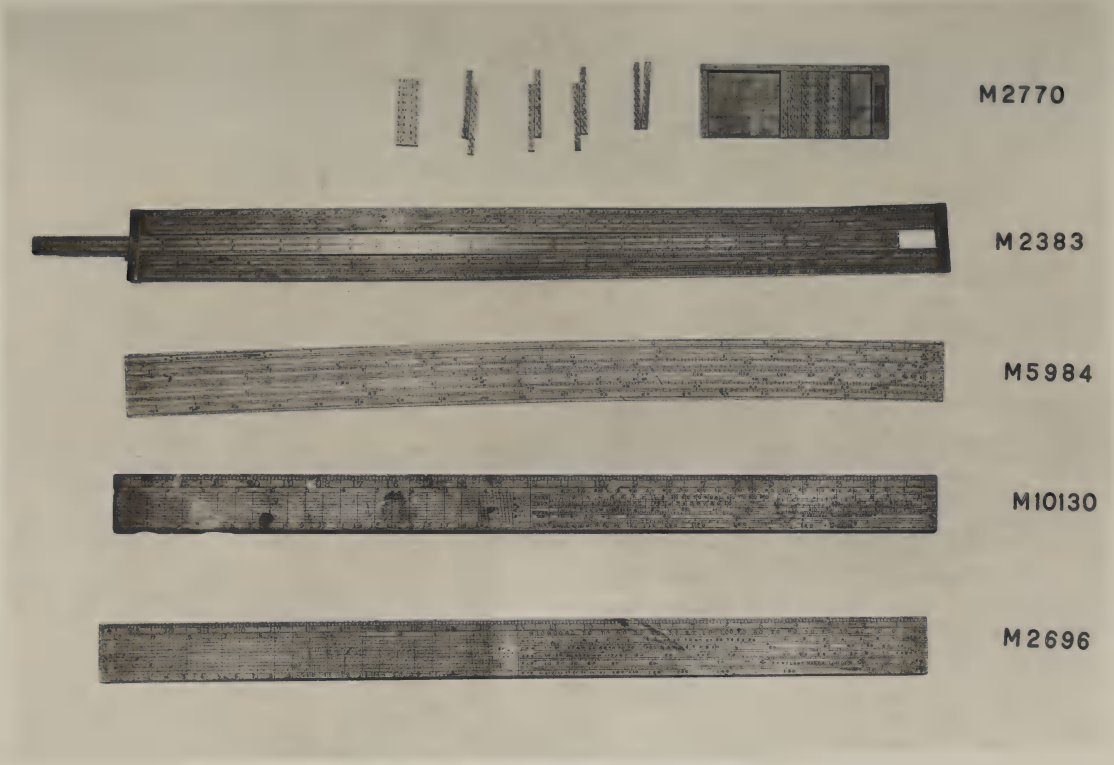


Plate LI. Computers

373 380 375 376 377

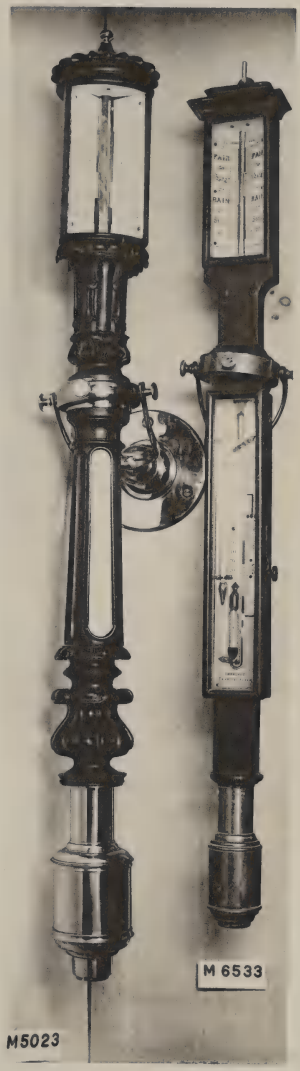


Plate LII. Barometers

386 387

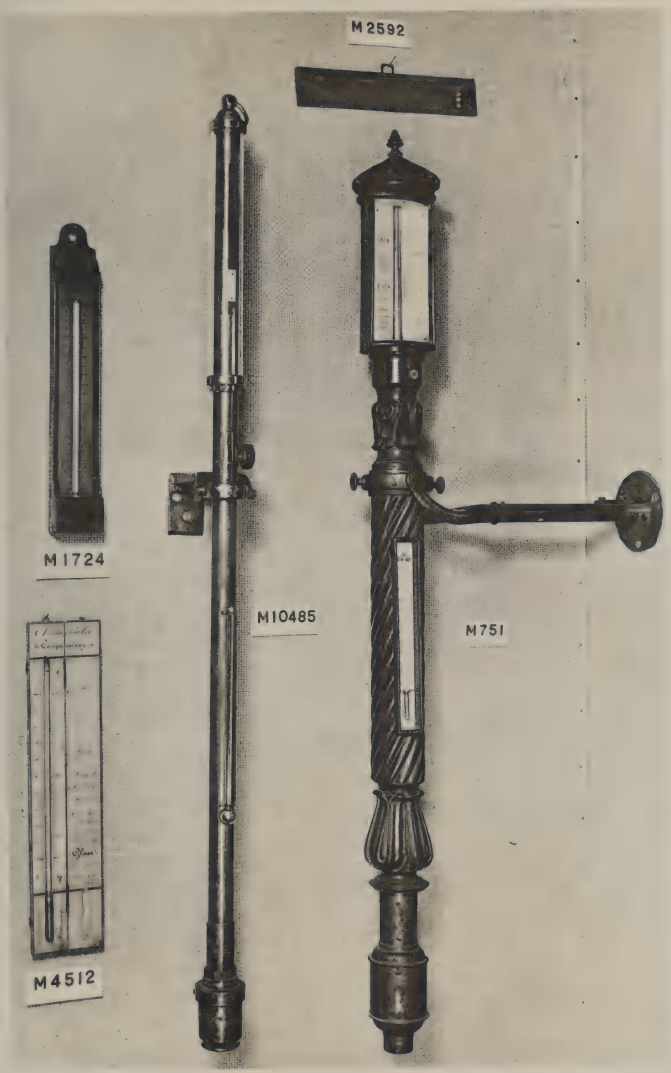


Plate LIII. Barometers and Thermometers

404 401
403 388 390

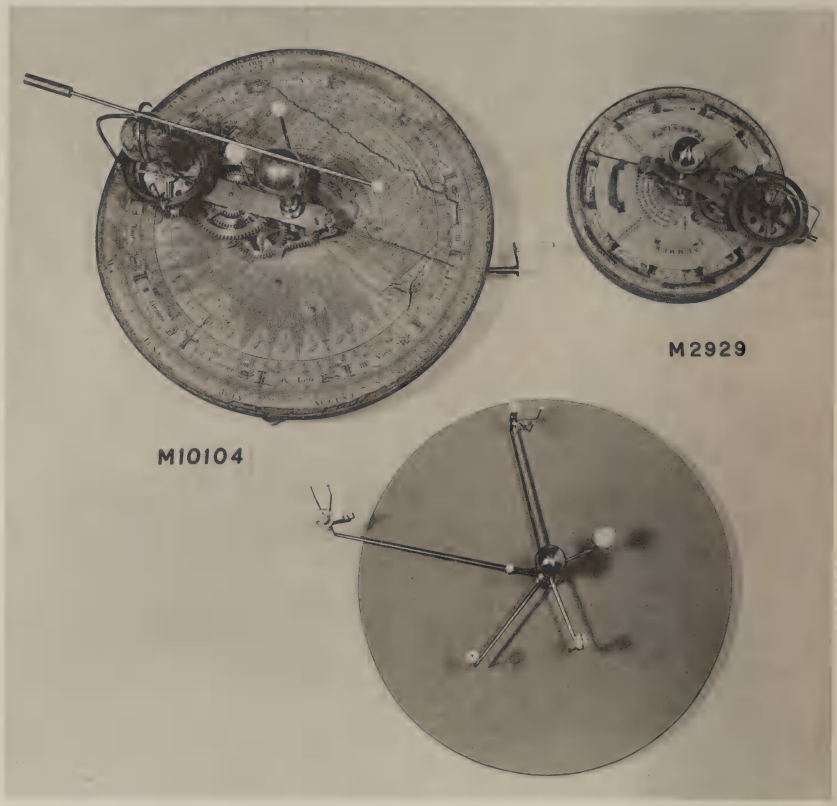


Plate LIV. Orreries

409 408

Plate LV. Japanese Planisphere, face

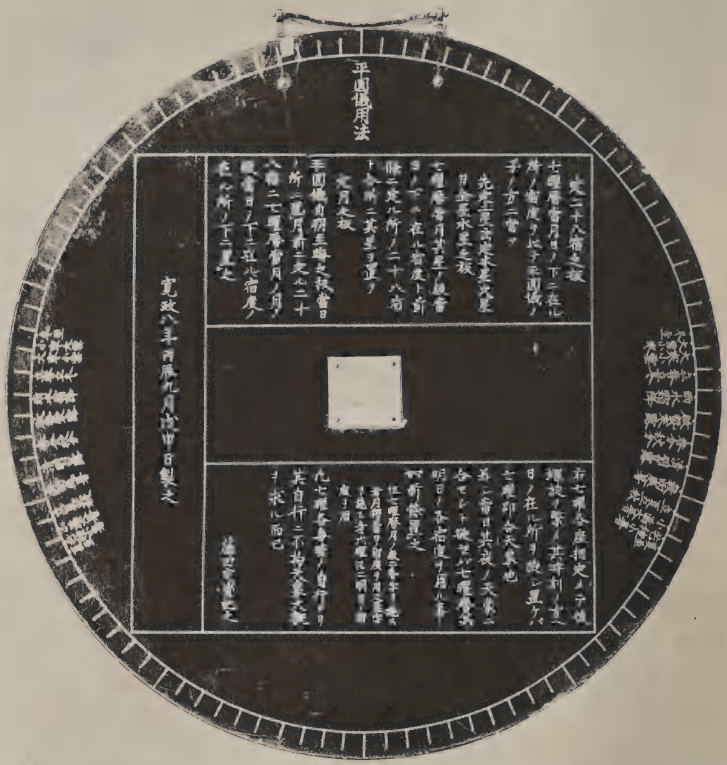


Plate LVI. Japanese Planisphere, reverse

INDEX

Index

This book is composed in Linotype Caslon Old Face. The original of this type was cut in 1722 by William Caslon of London. The composition and presswork by The Anthoensen Press of Portland, Maine, on special rag paper supplied by Andrews/Nelson/Whitehead, Inc., of New York for the Peabody Museum of Salem, Massachusetts. Collotypes by Meriden Gravure Company of Meriden, Connecticut. The book was bound by John W. Marchi of Portland, Maine.

1000 COPIES WERE PRINTED